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ENVIRONMENT DIRECTORATE
JOINT MEETING OF THE CHEMICALS COMMITTEE AND THE WORKING PARTY ON CHEMICALS, PESTICIDES AND BIOTECHNOLOGY

REPORT ON THE PROPOSAL FOR CLASSIFICATION AND LABELLING (C&L) OF DICYCLOPENTADIENE

Series on Testing & Assessment
No. 248

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OECD Environment, Health and Safety Publications

Series on Testing & Assessment

No. 248

REPORT ON THE PROPOSAL FOR CLASSIFICATION AND LABELLING (C&L) OF DICYCLOPENTADIENE

Joint Pilot Project of the OECD and the UN Sub-Committee of Experts on the Globally Harmonised System of Classification and Labelling of Chemicals

IOMC

INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS

A cooperative agreement among FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD

Environment Directorate

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Paris, 2016

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This publication is available electronically, at no charge.

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FOREWORD

In 2014, the OECD Task Force on Hazard Assessment (TFHA) and the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology (JM) agreed to provide a coordination role for a pilot classification project upon invitation from the UN Sub-Committee of Experts on the Globally Harmonised System of Classification and Labelling of Chemicals (UNSCEGHS). A report of the Pilot Project of the OECD and the UN Sub-Committee of Experts on the Globally Harmonised System of Classification and Labelling of Chemicals detailing the process of the pilot project and learnings is published along with this report. (Report on the Pilot Project on Assessing the Potential Development of a Global List of Classified Chemicals. ENV/JM/MONO(2016)43, Series on Testing & Assessment No. 246). It also contains a template for Proposals for Classification and Labelling (Annex 1 to ENV/JM/MONO(2016)43/ANN1/PART1 & PART2).

Accompanying the report are three case study chemicals where non-binding agreement on their classification have been reached. The results of this pilot project will be submitted to the UNSCEGHS for consideration in their deliberations on the potential development of a global list of classified chemicals.

This report on the Proposal for Classification and Labelling (C&L) of Dicyclopentadiene was prepared by the Russian Federation, with review and input from the project team established for this pilot project under the OECD Task Force for Hazard Assessment. It contains a C&L report as well as an Annex with additional background information.

The following two reports on the Proposal for Classification and Labelling (C&L) are published with this report:

1. Report on the Proposal for Classification and Labelling (C&L) of Dimethyltin Dichloride ENV/JM/MONO(2016)44, Series on Testing & Assessment No. 247.

2. Report on the Proposal for Classification and Labelling (C&L) of Dibutyl Phthalate ENV/JM/MONO(2016)46, Series on Testing & Assessment No. 249.

This document is being published under the responsibility of the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology.

Proposal for Classification and Labelling (C&L)

Based on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

International Chemical Identification: Dicyclopentadiene

CAS Number: 77-73-6

Contact details for dossier submitter:
Russian Federation (CIS Center)

Version number: 4 **Date: 15/06/2016**

Note on confidential information
Please be aware that this report is intended to be made publicly available. Therefore it should not contain any confidential information.

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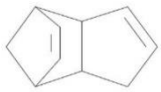
1. IDENTITY OF THE SUBSTANCE

1.1 Name and other identifiers of the substance

Table 1: Substance identity and information related to molecular and structural formula of the substance

International Chemical Identification - **Name(s) in the IUPAC nomenclature or other international chemical name(s)**	3a,4,7,7a-tetrahydro-1H-4,7-methanoindene
Other names (usual name, trade name, abbreviation)	DCPD Dicyclopentadiene Bicyclopentadiene Biscyclopentadiene 3a,4,7,7a-Tetrahydro-4,7-methano-1H-indene 3a,4,7,7a-Tetrahydro-4,7-methanoindene 4,7-Methano-1H-indene, 3a,4,7,7a-tetrahydro- 3a,4,7,7a-tetrahydro-4,7-methanoindene Cyclopentadiene dimer 1,3-Cyclopentadiene dimer Alpha-dicyclopentadiene (endo form)
ISO common name (if available and appropriate)	Not applicable.
CAS number (if available)	77-73-6
Other identifier(s) (if available)	EC number: 201-052-9 RTECS No. PC1050000
In case the substance is already included in a classification list - identifier of the entry	EU Index number in Annex VI, CLP Regulation: 601-044-00-9 NITE Classification ID: 783 HNSO CCID Approval Number: HSR001123
Molecular formula	$C_{10}H_{12}$
Structural formula	
SMILES notation (if available)	C12C3C=CC(C3)C1C=CC2
Molecular weight or molecular weight range	132.20 g/mol
Information on optical activity and typical ratio of (stereo) isomers (if applicable and appropriate)	DCPD can exist as two stereoisomers, the endo and exo forms, with commercial DCPD being predominantly the endo isomer. *[Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984., p. V7 417 (1979)]*
Description of the manufacturing process and identity of the source (for UVCB substances only)	Not a UVCB substance.
Degree of purity (%) (if relevant for the classification proposal)	75% < conc. > 99%

1.2 Composition of the substance

Table 2: Constituents (non-confidential information)

Constituent (Name and numerical identifier)	Concentration range (% w/w minimum and maximum)
3a,4,7,7a-tetrahydro-1H-4,7-methanoindene	75% < conc. > 99%

Table 3: Impurities (non-confidential information) if relevant for the classification of the substance

Impurity (Name and numerical identifier)	Concentration range (% w/w minimum and maximum)	The impurity contributes significantly to the classification and labelling
The available information on impurities was included in appropriate summary tables.		

Table 4: Additives (non-confidential information) if relevant for the classification of the substance

Additive (Name and numerical identifier)	Function	Concentration range (% w/w minimum and maximum)	The additive contributes significantly to the classification and labelling (yes/no)
No data available.			

Table 5: Test substances (non-confidential information)

Identification of test substance	Purity	Impurities and additives (identity, %, classification if available)	Other information	The study(ies) in which the test substance is used
Not considered useful for this dossier.				

2. PROPOSED CLASSIFICATION AND LABELLING

2.1 Proposed classification and labelling according to the GHS criteria (GHS rev. 6)

Table 6: Proposed classification and reason for not proposing a classification for a hazard class

GHS chapter ref.	Hazard class or differentiation	Proposed classification - Hazard Class and Category Code(s); Hazard statement Code(s)	Proposed SCL(s) and M-factor(s)	Reason for no proposed classification*
2.1	**Explosives**	Not classified		Hazard class not applicable
2.2	**Flammable gases**	Not classified		Hazard class not applicable
2.3	**Aerosols**	Not classified		Hazard class not applicable
2.4	**Oxidising gases**	Not classified		Hazard class not applicable
2.5	**Gases under pressure**	Not classified		Hazard class not applicable
2.6	**Flammable liquids**	Flam. Liq. 3; H226 *for liquid DCPD (see Note 1)*		
2.7	**Flammable solids**	Not classified		Data lacking
2.8	**Self-reactive substances**	Not classified		Hazard class not applicable
2.9	**Pyrophoric liquids**	Not classified		Hazard class not applicable
2.10	**Pyrophoric solids**	Not classified		Hazard class not applicable
2.11	**Self-heating substances**	Not classified		Hazard class not applicable
2.12	**Substances which in contact with water emit flammable gases**	Not classified		Hazard class not applicable
2.13	**Oxidising liquids**	Not classified		Hazard class not applicable
2.14	**Oxidising solids**	Not classified		Hazard class not applicable
2.15	**Organic peroxides**	Not classified		Hazard class not applicable
2.16	**Corrosive to metals**	Not classified		Data lacking
2.17	**Desensitized explosives**	Not classified		Hazard class not applicable
3.1	**Acute toxicity** **- via oral route**	Acute Tox. 3; H301		
	- via dermal route	Acute Tox. 5; H313		
	- via inhalation route	Acute Tox. 2; H330		
3.2	**Skin corrosion/irritation**	Skin Irrit. 2; H315		

3.3	**Serious eye damage/eye irritation**	Not classified		Data conclusive but not sufficient for classification
3.4	**Respiratory sensitisation**	Not classified		Data lacking
	Skin sensitisation	Not classified		Data conclusive but not sufficient for classification
3.5	**Germ cell mutagenicity**	Not classified		Data conclusive but not sufficient for classification
3.6	**Carcinogenicity**	Not classified		Data lacking
3.7	**Reproductive toxicity**	Repr.2; H361 (developmental toxicity)		
3.8	**Specific target organ toxicity-single exposure**	STOT SE 3; H335, H336		
3.9	**Specific target organ toxicity-repeated exposure**	STOT RE 2; H373		
3.10	**Aspiration hazard**	Asp. Tox. 1; H304		
4.1	**Hazardous to the aquatic environment**	Aquatic Acute 1; H400 Aquatic Chronic 2; H411	M=1	
4.2	**Hazardous to the ozone layer**	Not classified.		Hazard class not applicable
** Note 1. Above 32.2 °C/90° F, the pure substance is a liquid as also commercial grades with purity < 97% at room temperature*				

Proposed labelling

Pictogram Code(s): GHS02 (Flame), GHS06 (Skull and crossbones), GHS08 (Health hazard), GHS09 (Environment)

Signal Word Code(s): Danger.

Hazard statement Code(s):

H226: Flammable liquid and vapour [*for liquid DCPD*]
H301: Toxic if swallowed.
H304: May be fatal if swallowed and enters airways.
H313: May be harmful in contact with skin.
H315: Causes skin irritation.
H330: Fatal if inhaled.
H335: May cause respiratory irritation.
H336: May cause drowsiness and dizziness.

H361: Suspected of damaging the unborn child.

H373: May cause damage to organs through prolonged or repeated exposure via oral and inhalation routes of exposure

H400: Very toxic to aquatic life.

H411: Toxic to aquatic life with long lasting effects.

Supplemental information:

According to 1.410.5.3.1 (a) if the skull and crossbones applies, the exclamation mark should not appear. According to 1.410.5.3.2 if the signal word "Danger" applies, the signal word "Warning" should not appear.

3. IDENTIFIED USES

Intermediate for ethylene-propylene elastomers for resins, pesticides, flame retardants, adhesive, coatings.

4. DATA SOURCES

- ECHA's web-site: Search for Chemicals: CAS 77-73-6 http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/1
- Data bank of environmental properties of chemicals - The Finnish Environment Institute (SYKE) http://wwwp.ymparisto.fi/scripts/Kemrek/Kemrek_uk.asp?Method=MAKECHEMdetailsform&txtChemId=2070
- US EPA Screening-level hazard characterization Document, December 2010. Available online at http://www.epa.gov/chemrtk/hpvis/hazchar/Category_Resin%20Oils_December_2010.pdf
- OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6). Available online at http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf as of September 28, 2010.
- Hazardous Substances Data Bank (HSDB) of TOXNET Databases.
- Chemical Carcinogenesis Research Information System (CCRIS) of TOXNET Databases.
- Dow DCPD Product Handling Guide. Available online at http://msdssearch.dow.com/PublishedLiteratureDOWCOM/dh_0957/0901b803809577d1.pdf?filepath=aromatics/pdfs/noreg/778-04301.pdf&fromPage=GetDoc

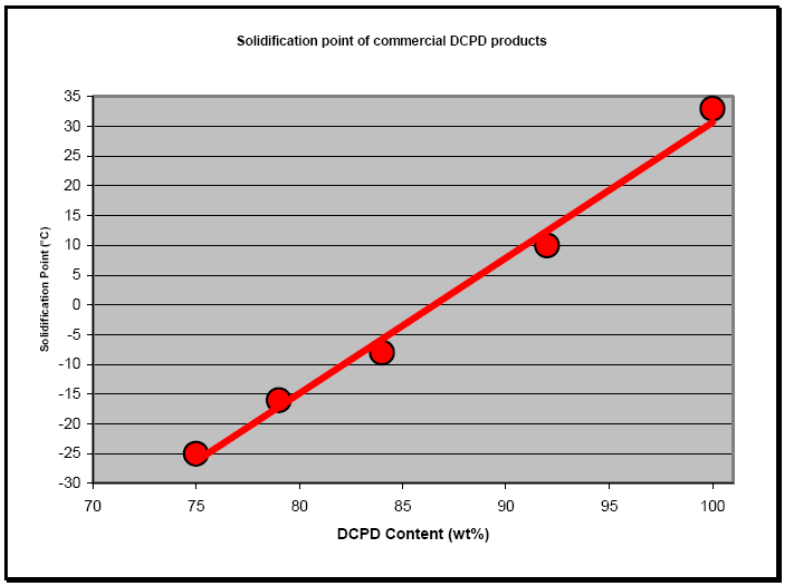
5. PHYSICOCHEMICAL PROPERTIES

Table 7: Summary of physicochemical properties

Property	Value	Reference	Comment (e.g. measured or estimated)
Physical state at 20°C and 101,3 kPa	Colorless crystalline solid which became a liquid above 90° F (32.2°C) Waxy solid at room temperature. However the degree of solidity will depend on the impurities.	(1) HSDB ECHA website, unnamed publication 1991	Based on additional information provided by industry, the physical state of DCPD is dependent on the purity. The pure substance is a waxy solid at room temperature. Commercial grades with purity < 97% are liquid at room temperature.
Melting/freezing point	32.2°C 33.6°C 32°C (-25)°C - 32.2°C 32.5 °C 32 - 34 °C 10.6 °C -25 - 10 °C	(1) ECHA website (2)OECD SIDS (3) US EPA Dow DCPD product handling guide (12) ECHA website (13) ECHA website ECHA website. Proprietary data (Shell 2016) ECHA website. Proprietary data (2016).	measured measured measured measured. It illustrated that the melting point of DCPD is dependent on the purity. *see Note 1 measured according to ASTM 1493 for 94% DCPD measured for DCPD with purity 75 - <95%.
Boiling point	172.2°C at 760mmHg 170.7°C 170-172°C 80 - 190 °C	(1) ECHA website (2)OECD SIDS (13) ECHA website ECHA website. Proprietary data (2016).	measured measured The test substance decomposes at this temperature range (170-172°C) measured for DCPD with purity >80%.
Density	0.977 g/m^3 at 35 °C 0.93 g/cm^3 at 35 °C 975-989 kg/m3 at 20°C	(4) OECD SIDS (5) ECHA website ECHA website. Proprietary data (Shell 2016)	 measured measured according to ASTM D4052 for 94% DCPD
Relative density	1.049 g/cm^3 (20°C)	ECHA website	
Vapour pressure	1.3 x 10^3 Pa at 37.7 °C 1.86 hPa at 20 °C	(6) OECD SIDS (7) ECHA website	measured measured
Surface tension	Not applicable		
Water solubility	20 mg/l at 25 °C 0.020 lb/100 lb water at 68.02 deg F (20°C) In water, 26.5 mg/L at 25 deg C	(8) OECD SIDS (9) HSDB (10) HSDB	Slightly soluble, measured Estimated
Partition coefficient n-octanol/water	2.78	(11) OECD SIDS	measured
Flash point	32.2°C at 1013.5 hPa 41°C 23 - 32°C	(1) ECHA website (4) (12) ECHA website ECHA website.	measured measured for DCPD with purity

		Proprietary data (2016).	>80%.
Flammability	flammable	ECHA website: Internal data of Shell International Chemical Company Ltd.,|May 1994	
Auto flammability	503 °C	(13) ECHA website	measured
Explosive properties	Lower and upper explosion limits are 0.8% and 6.3% vol, respectively	(1) ECHA website (4)	measured
Self-ignition temperature	No data available		
Oxidising properties	None	OECD SIDS	Study scientifically unjustified
Granulometry	No data available		
Stability in organic solvents and identity of relevant degradation products	Soluble Very soluble in ethyl ether, ethanol Readily soluble in acetone, dichloromethane, ethyl acetate, n-hexane, and toluene.	(14) HSDB (15) HSDB	Study scientifically unjustified
Dissociation constant	Not applicable		Study scientifically unjustified - no ionizable functional group
Viscosity	0.736 cP (est) at 70 deg F 2.811mm²/s at 40°C 1-5 mPa.s at 20°C	HSDB (9) ECHA website. Proprietary data (2016). ECHA website. Proprietary data (2016).	Purity unknown. Based on information provided by industry, the pure substance is a waxy solid at room temperature. However commercial grades with purity < 97 % are liquid at room temperature and typically have a viscosity of < 2 cP. measured according to ASTM 445 for 94% DCPD measured for DCPD with purity >80%.
Henry's Law Constant	0.020 atmm3/mol 830 Pa * mE+3 * molE-1 6.25X10-2 atm-cum/mol at 25 deg C (est) 1 229.6 Pa m³/mol 6340 Pa.m3/mole.	(16) (4) OECD SIDS (16) HSDB ECHA website ECHA website	Estimated Estimated QSAR calculation (EPISiute v4.00)

**Note 1.* Based on Dow internal measurements it has been shown that the melting point is ranging from approximately -25 °C to 32.2°C with increasing purity, as illustrated in the graph below



(1) NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) (2005)

(2) OECD SIDS: Kagaku daijiten (Chemical dictionary)

(3) US EPA: SRC. The Physical Properties Database (PHYSPROP). Syracuse, NY: Syracuse Research Corporation. Available online at http://www.syrres.com/esc/physprop.htm as of

August 18, 2010

(4) OECD SIDS: IUCLID Database

(5) CRC Press, Boca Raton, Handbook of Chemistry and Physics, 2008

(6) The Sigma-Aldrich Library of Reguratory and Safety Data

(7) Kinkead, E.R. et al. (1971): Toxicol. Appl. Pharmacol. 20, 552- 561.

(8) MITI, Japan (1997) Test was performed by CITI, Japan. Protocol OECD TG 105

(9) U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.

(10) US EPA; Estimation Program Interface (EPI) Suite. Ver.3.12. Nov 30, 2004. Available from, as of Oct 26, 2006: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm

(11) MITI, Japan (1997) Test was performed by CITI, Japan. Protocol OECD TG 107

(12) Ullmann's Encyclopedia of Industrial Chemistry. Fifth, Completely Revised Edition, Vol. A8 (1987), S. 227-228.

(13) WHO International Programme on Chcemical Safety, Chemical Safety Card: Dicyclopentadiene, ICSC-0873 (2005)

(14) HSDB: Lide, D.R. CRC Handbook of Chemistry and Physics 86TH Edition 2005-2006. CRC Press, Taylor & Francis, Boca Raton, FL 2005, p. 3-162

(15) HSDB: Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987., p. A716/Aug 87

(16) U.S. EPA. 2010. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA. Available

online at http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of September 15, 2010.

6. EVALUATION OF PHYSICAL HAZARDS

6.1 Explosives

Table 8: Summary table of studies on explosive properties

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on explosive properties

Study scientifically unjustified: there are no chemical groups associated with explosive properties present in the molecule.

Comparison with the GHS criteria

According to item 2.1.4.2.2 (a) of the GHS a substance is not classified as explosive if there are no chemical groups associated with explosive properties present in the molecule.

Conclusion on classification and labelling for explosive properties

Not classified.

6.2 Flammable gases

Table 9: Summary table of studies on flammable gases

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on flammable gases

Study is not applicable: DCPD is a solid or liquid (commercial grades with purity <97%) at 20°C and 101,3 kPa.

Comparison with the GHS criteria

Not applicable.

Conclusion on classification and labelling for flammable gases

Not classified.

6.3 Aerosols

Table 10: Summary table of studies on aerosols

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on aerosols

Study scientifically unjustified: DCPD is not aerosol products.

Comparison with the GHS criteria

Not applicable.

Conclusion on classification and labelling for aerosols

Not classified.

6.4 Oxidising gases

Table 11: Summary table of studies on oxidising gases

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on oxidising gases

Study is not applicable: DCPD is a solid or liquid (commercial grades with purity <97%) at 20°C and 101,3 kPa.

Comparison with the GHS criteria

Not applicable.

Conclusion on classification and labelling for oxidising gases

Not classified.

6.5 Gases under pressure

Table 12: Summary table of studies on gases under pressure

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on gases under pressure

Study is not applicable: DCPD is a solid or liquid (commercial grades with purity <97%) at 20°C and 101,3 kPa.

Comparison with the GHS criteria

Not applicable.

Conclusion on classification and labelling for gases under pressure

Not classified.

6.6 Flammable liquids

Table 13: Summary table of studies on flammable liquids

Method	Results	Remarks	Reference
Unknown	Flash point: 32.2 °C at 1013.5 hPa		NIOSH. Pocket Guide to Chemical Hazards (2005). National Institute for Occupational Safety & Health
Unknown	Flash point: 32 °C		WHO International Programme on Chemical Safety, 2005. Chemical Safety Card: Dicyclopentadiene ICSC-0873
Open cup	Flash point: 32 °C		Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-41
Unknown	Flash point: 32.2°C		Sax, N.I. (1979): Dangerous Properties of Industrial|Materials, Fifth Edition, Van Nostrand Reinhold Comp. Inc., New York, S. 569
Unknown	Flash point: 41°C		Ullmann"s Encyclopedia of Industrial Chemistry. Fifth, Completely Revised Edition, Vol. A8 (1987), S. 227-228
Unknown	Flash point: >23°C, typically 25-32°C at 1013 hPa	Tested substance: commercial DCPD (>80% purity)	Data taken from ECHA dissemination website with reference to proprietary data: results (2016) are taken from company specific pro-forma

Short summary and overall relevance of the provided information on flammable liquids

No information on the primary sources of this data or the methods used for most studies is available. However, most of the data are taken from a reliable government source and is therefore considered to be suitable for use. The lowest flash point was measured for commercial DCPD (>80%) as >23 °C The highest flash point was reported as 41°C. Apart from company data, the study reports don't provide information on physical state of the tested substances and its purity which also affects the physical state: the pure substance is a waxy solid at room temperature. Commercial grades with purity < 97% are liquid at room temperature. For the purpose of this exercise it is proposed to be assumed that flash points were obtained by testing a liquid substance: DCPD with purity < 97%.

Comparison with the GHS criteria

In comparison with the GHS criteria all data on flash point of DCPD is within the range of Category 3: 23°C ≤ (23°C ÷ 41°C) ≤ 60°C.

Conclusion on classification and labelling for flammable liquids

According to the GHS criteria Category 3 for flammable liquids is proposed for liquid DCPD, including DCPD with purity < 97% based on the flash point.
Symbol: Flame.
Signal word: Warning.
Hazard statement: H226: Flammable liquid and vapour.

6.7 Flammable solids

Table 14: Summary table of studies on flammable solids

Method	Results	Remarks	Reference
Unknown	Melting and flash point: 32.2 °C at 1013.5 hPa	A liquid above 90 F (32.2°C)	NIOSH Pocket Guide to Chemical Hazards(2005)
No studies of burning rate are available.			

Short summary and overall relevance of the provided information on flammable solids

No studies are available.

Comparison with the GHS criteria

It is not possible to compare with the GHS criteria because of data lacking.

Conclusion on classification and labelling for flammable solids

Not classified.

6.8 Self-reactive substances

Table 15: Summary table of studies on self-reactivity

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on self-reactive substances

Study scientifically unjustified: there are no chemical groups associated with explosive properties present in the molecule.

Comparison with the GHS criteria

According to item 2.8.4.2 (a) of the GHS the classification procedures for self-reactive substances need not be applied if there are no chemical groups present in the molecule associated with explosive or self-reactive properties.

Conclusion on classification and labelling for self-reactive substances

Not classified.

6.9 Pyrophoric liquids

Table 16: Summary table of studies on pyrophoric liquids

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on pyrophoric liquids

Study is not applicable for solid DCPD. Regarding liquid DCPD (commercial grades with purity <97%) study scientifically unjustified: liquid DCPD is stable at room temperature for prolonged periods of time.

Comparison with the GHS criteria

According to item 2.9.4.2 of the GHS the classification procedures for pyrophoric liquids need not be applied when experience in production or handling shows that the substance does not ignite spontaneously on coming into contact with air at normal temperatures (i.e. the substance is known to be stable at room temperature for prolonged periods of time (days)).

Conclusion on classification and labelling for pyrophoric liquids

Not classified.

6.10 Pyrophoric solids

Table 17: Summary table of studies on pyrophoric solids

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on pyrophoric solids

Study scientifically unjustified: DCPD is a stable solid at room temperature for prolonged periods of time.

Comparison with the GHS criteria

According to item 2.10.4.2 of the GHS the classification procedures for pyrophoric solids need not be applied when experience in production or handling shows that the substance does not ignite spontaneously on coming into contact with air at normal temperatures (i.e. the substance is known to be stable at room temperature for prolonged periods of time (days)).

Conclusion on classification and labelling for pyrophoric solids

Not classified.

6.11 Self-heating substances

Table 18: Summary table of studies on the hazard class self-heating substances

Method	Results	Remarks	Reference
No data	Melting point: 32.2°C	a liquid above 90° F (32.2°C)	NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) (2005)
No data	The test substance decomposes at boiling temperature range (170-172°C)		WHO International Programme on Chemical Safety, Chemical Safety Card: dicyclopentadiene, ICSC-0873 (2005)
No data	Auto flammability: 503 °C		WHO International Programme on Chemical Safety, Chemical Safety Card: dicyclopentadiene, ICSC-0873 (2005)

Short summary and overall relevance of the provided information on self-heating substances

Study is not applicable based on the data in the Table above.

Comparison with the GHS criteria

The GHS criteria for self-heating substances based on the ability of a substance to undergo oxidative self-heating determined by exposure of it to air at temperatures of 140°C in a 25 mm or 100 mm wire mesh cube (test N.4 of UN Manual of Tests and Criteria). The DCPD is a liquid at 140°C, therefore it is not possible to perform the test.
According to the GHS definition a self-heating substance is a solid or liquid other than a pyrophoric liquid or solid, which, by reaction with air and without energy supply, is liable to self-heat; this substance or mixture differs from a pyrophoric liquid or solid in that it will ignite only when in large amounts

(kilograms) and after long periods of time (hours or days). As DCPD is stable solid at room temperature for prolonged periods of time DCPD is not predicted to be a self-heating.

Conclusion on classification and labelling for self-heating substances

Not classified.

6.12 Substances which in contact with water emit flammable gases

Table 19: Summary table of studies on substances which in contact with water emit flammable gases

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on substances which in contact with water emit flammable gases

Study scientifically unjustified: DCPD does not contain metals or metalloids.

Comparison with the GHS criteria

According to item 2.12.4.2 (a) of the GHS the classification procedures for this class need to be applied if the chemical structure of the substance does not contain metals or metalloids.

Conclusion on classification and labelling for substances which in contact with water emit flammable gases

Not classified.

6.13 Oxidising liquids

Table 20: Summary table of studies on oxidising liquids

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on oxidising liquids

Study scientifically unjustified: DCPD does not contain oxygen, fluorine or chlorine.

Comparison with the GHS criteria

According to item 2.13.4.2.3 (a) of the GHS the classification procedures for this class need to be applied to organic substances if the substance does not contain oxygen, fluorine or chlorine.

Conclusion on classification and labelling for oxidising liquids

Not classified.

6.14 Oxidising solids

Table 21: Summary table of studies on oxidising solids

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on oxidising solids

Study scientifically unjustified: DCPD does not contain oxygen, fluorine or chlorine.

Comparison with the GHS criteria

According to item 2.14.4.2.2 (a) of the GHS the classification procedures for this class need to be applied to organic substances if the substance does not contain oxygen, fluorine or chlorine.

Conclusion on classification and labelling for oxidising solids

Not classified.

6.15 Organic peroxides

Table 22: Summary table of studies on organic peroxides

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on organic peroxides

Study scientifically unjustified: DCPD does not contain the bivalent -O-O- structure.

Comparison with the GHS criteria

DCPD is not organic peroxides in comparison with the GHS definition (organic peroxides are liquid or solid organic substances which contain the bivalent -O-O-), therefore shall not be considered for classification in this class.

Conclusion on classification and labelling for organic peroxides

Not classified.

6.16 Corrosive to metals

Table 23: Summary table of studies on the hazard class corrosive to metals

Method	Results	Remarks	Reference
No data	Non-corrosive		Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987., p. A716/Aug 87

Short summary and overall relevance of the provided information on the hazard class corrosive to metals

No information on the primary source of this data or the method used is available. However, this information is suitable for use for this endpoint because it is taken from a reliable peer reviewed database: HSDB.

Comparison with the GHS criteria

The comparison with the GHS criteria is not possible because of the lack of study details.

Conclusion on classification and labelling for corrosive to metals

Not classified.

6.17 Desensitized explosives

Table 24: Summary table of studies on desensitized explosive properties

Method	Results	Remarks	Reference
-	-	-	-

Short summary and overall relevance of the provided information on desensitized explosive properties

Study scientifically unjustified: there are no chemical groups associated with explosive properties present in the molecule.

Comparison with the GHS criteria

Not applicable.

Conclusion on classification and labelling for desensitized explosive properties

Not classified.

7. TOXICOKINETICS (ABSORPTION, METABOLISM, DISTRIBUTION AND ELIMINATION)

Table 25: Summary table of toxicokinetic studies

Method	Results	Remarks	Reference
No guideline available Principles of method: Rates of absorption, tissue distribution, metabolism and rate of excretion of 14C labelled DCPD rat, Sprague-Dawley, male, Single dose, 100 mg/kg bw by gavage, vehicle: corn oil	Absorption was rapid, Cp_{max} was 23.28 µg/ml at 6 h. Concentrations were greater in plasma than blood. Elimination from plasma was biphasic, the terminal half life was 27h. Radioactivity was widely distributed, C_{max} at 2-6 hours, highest concentrations were in the fat, adrenals and urinary bladder. Radioactivity was still detectable in all tissues at 72 hours. The primary route of excretion of 14C was via urine. 94% of radioactivity was recovered within 72 h with approximately 75% in urine. Metabolites identified. Urine contained 7 radioactive components; the major polar component accounted for 41% of the total radioactivity. No DCPD was detected. Conjugates were present.		Author not specified. Report date 1976-06-24 Data source: ECHA web-site - Exp Key Basic toxicokinetics.002
No guideline available Principles of method: Rates of absorption, tissue distribution, metabolism and rate of excretion of 14C labelled DCPD dog, Beagle, male, Single dose, 100 mg/kg bw.; oral; vehicle: corn oil	Absorption was rapid, Cp_{max} was 39.9 µg/ml at 2 h. Concentrations were greater in plasma than blood. Elimination from plasma was biphasic with half lives of 10 and 18h. Radioactivity was widely distributed, C_{max} at 4-24 hours, highest concentrations were in the bile, gall bladder, bladder and stomach. Radioactivity was still detectable in most tissues at 7 days. The primary route of excretion of 14C was via urine. 85% of radioactivity was recovered within 72 h with approximately 81% in urine. Metabolites identified. Urine contained 6 radioactive components; the major polar component accounted for 81% of the total radioactivity. No DCPD was detected. Conjugates were present. The distribution of radioactivity in the eye was assessed. The highest levels were in all parts of the eye at 4 h. After that time, radioactivity was greatly reduced but was still detected in all parts of the eye at 7 days.		Author not specified. Report date 1976-06-24 Data source: ECHA web-site - Exp Key Basic toxicokinetics.003

No guideline available Principles of method: Rates of absorption, tissue distribution, metabolism and rate of excretion of 14C labelled DCPD mouse, Swiss Webster, male, Single dose, 40 mg/kg bw. by gavage, vehicle: corn oil	Absorption was rapid, Cp_{max} was 11.36µg/ml at 2 h. Concentrations were greater in plasma than blood. Elimination from plasma was biphasic with half lives of 4 and 18 h. Radioactivity was widely distributed, C_{max} at 1-2 hours, highest concentrations were in the bladder, gall bladder and fat. Radioactivity was still detectable in most tissues at 72 hours. The primary route of excretion of 14C was via urine. 92% of radioactivity was recovered within 48 h with approximately 70% in urine. Metabolites identified. Urine contained 7 radioactive components; the major polar component accounted for 56% of the total radioactivity. No DCPD was detected. Conjugates were present		Author not specified. Report date 1976-06-24 Data source: ECHA web-site - Exp Key Basic toxicokinetics.001
No guideline available Principles of method: Blood samples, urine, faeces and milk were collected at intervals. The cow was killed 96 hours after dosing with [14C] DCPD and several tissues were taken. Excretion and tissue retention were determined. cattle, Jersey, female, single dose, 10 mg/kg bw, oral: capsule Vehicle: no	Radiocarbon was quite rapidly excreted following oral dosing of [14C] DCPD (c.a. 81% of administered [14C] eliminated in urine, c.a. 4% in faeces, <0.1% secreted into milk). Radiocarbon in whole blood reached maximum levels (290 dpm/g) within 2 hr of dosing. Blood radiocarbon levels then declined rapidly, residues were not detectable (<20 dpm/g) in samples collected more than 24 hr after treatment. None of the tissue samples collected contained detectable radiocarbon residues. Metabolites identified. In urine, glucuronide conjugates possibly formed through epoxidation of one or both of the DCPD double bonds followed by hydrolysis of the epoxides to diols (or possibly epoxy diols or tetraols), then ultimately conjugation with glucuronic acid. Bioaccessibility: Only exceedingly low levels of radiocarbon appeared in milk, and residues were not detected in samples collected more than 48 hr post-treatment. Little was learned about the chemical nature of DCPD metabolites except that, in urine, they are primarily in the form of glucuronide conjugates. It may well be that these metabolites in the cow arose, at least in part, through epoxidation of one or both of the DCPD double bonds followed by hydrolysis of the epoxides to diols (or possibly epoxy diols or tetraols), then ultimately conjugation with glucuronic acid.	Blood samples, urine, faeces and milk were collected at intervals. The cow was killed 96 hours after dosing with [14C] DCPD and several tissues were taken. Excretion and tissue retention were determined.	Publication of Ivie GW and Oehler DD: Fate of dicyclopentadiene in a lactating cow. Bull. Environm. Contam. Toxicol. 24, 662-670 (1980 year) Data source: ECHA web-site - Exp Supporting Basic toxicokinetics.004

Unknown	In general, although some DCPD can be exhaled unchanged, most of that absorbed is hydroxylated in the liver, undergoes glucuronide conjugation, and is excreted in the urine.		Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39 Data source: HSDB
Unknown	DCPD is predicted to be rapidly absorbed and distributed following any route of administration. It is extensively absorbed from the GI tract.		Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 4:203 Data source: HSDB
Unknown	The substance can be absorbed into the body by inhalation and by ingestion.		IPCS, CEC; International Chemical Safety Card on Dicyclopentadiene. (October 2005). Available from, as of October 03, 2006 Data source: HSDB

Short summary and overall relevance of the provided toxicokinetic information on the proposed classification(s)

Several studies on toxicokinetics of DCPD in different species are available. In all studies via oral route it was reported that DCPD was rapidly absorbed and radioactivity was widely distributed into tissues. The terminal elimination half life from plasma was 27 hours in male Sprague-Dawley rats. In male Beagle dogs and male Swiss Webster mice the elimination from plasma was biphasic with half lives of 10 and 18 hours respectively. Excretion was primarily in urine. The urine of mice and rats each had seven components. Six components were found in the urine of dogs. These included conjugates but no DCPD.
DCPD undergoes rapid and extensive metabolism in the lactating cow following oral exposure. Of the total radiolabelled dose administered about 86% was recovered in the urine and faeces, and only trace amounts were secreted into milk. The fact that more than 80% of the administered dose was ultimately excreted in the urine and only about 4% in faeces indicates that the orally administered DCPD was extensively absorbed from the gastrointestinal tract. Little was learned about the chemical nature of the metabolites during this study except that, in urine, they are primarily in the form of glucuronide conjugates.

There is also available information that DCPD can be absorbed following any route of administration including inhalation and by ingestion. In general, although some DCPD can be exhaled unchanged, most of that absorbed is hydroxylated in the liver, undergoes glucuronide conjugation, and is excreted in the urine.

8. EVALUATION OF HEALTH HAZARDS

8.1 Acute toxicity

Acute toxicity - oral route

Table 26a: Summary table of animal studies on acute oral toxicity

Method, test guideline, and deviation(s) if any	**Species, strain, sex, no/group**	**Test substance, reference to table 5**	**Dose levels, duration of exposure**	**Value LD_{50}**	**Reference**
OECD Guideline 401 GLP compliant	Sprague Dawley rats, male/female; Groups: 5 rats per sex per dose	75% DCPD Physical state: liquid	500, 794, 1260 and 2000 mg/kg bw. Observed 1 and 4 hours after dosing and once daily thereafter during 14 days	LD_{50} (male/female) = 590 mg/kg bw LD_{50} (male) = 512 mg/kg bw LD_{50} (female) = 676 mg/kg bw	Author not specified. Report date 1989-01-17 Data source: ECHA web-site, Exp Key Acute toxicity: oral.001
equivalent or similar to OECD Guideline 401 Non-GLP	Sprague Dawley rats, male/female; Groups: 10 rats per sex per dose	98-99% pure DCPD Physical state: waxy solid, liquefied on slight warning	278, 360, 464, 600 and 793 mg/kg bw Observations on day of dosing and daily thereafter during 14 days	LD_{50} (male/female) = 449 mg/kg bw LD_{50} (male) = 520 mg/kg bw LD_{50} (female) = 378 mg/kg bw	Author not specified. Report date 1976-06-24 Data source: ECHA web-site, Exp Supporting Acute Toxicity: oral.002
equivalent or similar to OECD Guideline 401 Non-GLP	Swiss Webster mice, male/female; Groups: 10 mice per sex per dose	98-99% pure DCPD Physical state: waxy solid, liquefied on slight warning	167, 215, 278, 360, 464 and 600 mg/kg bw Observations on day of dosing and daily thereafter during 14 days	LD_{50} (male/female) = 220 mg/kg bw LD_{50} (male) = 190 mg/kg bw LD_{50} (female) = 250 mg/kg bw	Author not specified. Report date 1976-06-24 Data source: ECHA web-site, Exp Supporting Acute Toxicity: oral.003
Unknown Non-GLP	Wistar rat, male Groups: 5 rats per dose	DCPD high purity Physical state: no data	Dose levels unknown, Obsevations during 14 days after exposure	LD_{50} (male) = 410 mg/kg bw	Smyth et al., 1962 Data source: US EPA Screening-level hazard characterization Document, 2010

Unknown Non-GLP	Rat; strain, sex and no/group are not specified	DCPD high purity Physical state: no data	Unknown	LD_{50} = 353 mg/kg bw	Kinkead et al., 1971 Data source: US EPA Screening-level hazard characterization Document, 2010
Unknown	Rat; strain, sex and no/group are not specified	DCPD No data on analytical purity and physical state	Unknown	LD_{50} = 0.35 mL/kg = approximately 350 mg/kg bw	American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2005., p. 1. Data source: HSDB
Unknown	Cattle; strain, sex and no/group are not specified	DCPD No data on analytical purity and physical state	Unknown	LD_{50} = 1200 mg/kg bw	Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39 Data source: HSDB

Table 26b: Summary table of human data on acute oral toxicity

Type of data/report	**Test substance, reference to table 5**	**Relevant information about the study (as applicable)**	**Observations**	**Reference**
No data available.				

Table 26c: Summary table of other studies relevant for acute oral toxicity

Type of study/data	**Test substance, reference to table 5**	**Relevant information about the study (as applicable)**	**Observations**	**Reference**
No data available.				

Short summary and overall relevance of the provided information on acute oral toxicity

There are a number of studies reported on the acute oral toxicity of DCPD, but the majority lack study details. The oral toxicity of DCPD was evaluated in one OECD TG 401 GLP compliant study in rats and two studies (in rats and in mice) conducted with methods equivalent or similar to OECD TG 401. Methods of other studies were not reported. In all studies according or similar to OECD TG 401, a difference in toxicity between male and female was observed, but in the first study in rat and in the study in mice males being more sensitive than females. Other study in rats showed that females were more sensitive than males. In report 1989 in rats, gross pathology effects include haemorrhagic lungs, dark liver and sloughing of the non-glandular gastric epithelium. The LD_{50} was calculated to be 590 mg/kg bw (male/female), 512 mg/kg bw (male) and 676 mg/kg/bw (female).

In other an acute oral toxicity study in fasted Sprague Dawley rats (report date 1976-06-24), gavage administration of DCPD (98-88% pure) caused signs of toxicity including red stains around the mouth and nose, decreased activity, occasional ataxia and prostration 1-4 hours after dosing. Hyperaemia of the lungs was observed at necropsy in some animals that died during the study but there were no gross abnormalities in rats which survived to the end of the study. The acute LD_{50} in fasted rats was calculated to be 449 mg/kg bw (male/female), 520 mg/kg bw (male) and 378 mg/kg bw (female).

In an acute oral toxicity study in fasted Swiss Webster mice, gavage administration of DCPD (in corn oil) at doses of between 167 and 600 mg/kg bw, caused signs of toxicity including decreased activity and prostration within 1-4 hours after dosing. Hyperaemia of the lungs, distension of the bladder, yellow fluid in the stomach and small intestines and black discolouration of areas of the liver and spleen were observed at necropsy in some animals that died during the study, but there were no gross abnormalities in mice which survived to the end of the study. The acute LD_{50} in fasted mice was calculated to be 220 mg/kg bw (male/female), 190 mg/kg bw (male) and 250 mg/kg bw (female), that represent the most sensitive result within available study reports. Thus, the study 1976-06-24 in Swiss Webster mice is considered as a key study for the pilot exercise purposes.

Comparison with the GHS criteria

The LD_{50} value of 220 mg/kg bw (male/female), 190 mg/kg bw (male) and 250 mg/kg bw (female) in Swiss Webster mice is within the range of values ($50 \leq ATE < 300$ mg/kg bw) supporting a classification in Category 3 for acute oral toxicity according to the GHS criteria.

Conclusion on classification and labelling for acute oral toxicity

Classification with Category 3 is proposed for acute toxicity via the oral route.
Symbol: Skull and crossbones
Signal word: Danger
Hazard statement: H301: Toxic if swallowed.

Acute toxicity - dermal route

Table 27a: Summary table of animal studies on acute dermal toxicity

Method, test guideline, and deviation(s) if any	**Species, strain, sex, no/group**	**Test substance, reference to table 5**	**Dose levels, duration of exposure**	**Value LD_{50}**	**Reference**
OECD Guideline 402 GLP compliant	Sprague-Dawley rat, male/female; No. of animals per sex per dose: 5	75% DCPD Physical state: liquid	2.06 mL/kg bw; Duration of exposure: 24 hours	LD_{50} (male/female) > 2000 mg/kg bw	Author not specified. Report date 1989-01-17 Data source: ECHA web-site, Exp Key Acute toxicity: dermal.001
equivalent or similar to OECD Guideline 402 Non-GLP	New Zealand White rabbit, male; No. of animals per sex per dose: 4	DCPD No data on analytical purity and physical state	Doses: Not reported; Duration of exposure: 24 hours	LD_{50} (male) = 4.46 mL/kg bw = 4460 mg/kg bw	Author not specified. Publication (1962) Data source: ECHA web-site, Exp Supporting Acute toxicity: dermal.002
equivalent or similar to OECD Guideline 402; Deviations: yes, study pre-dates guideline Non-GLP	New Zealand White rabbit, male; No. of animals per sex per dose: 4	DCPD No data on analytical purity and physical state	Doses: up to 20 mL/kg Duration of exposure: 24 hours	LD_{50} (male) = 6.72 mL/kg bw = 6720 mg/kg bw	Smyth HF, Carpenter CP, Weil CS and Pozzani UC, "Range-Finding Toxicity Data List V" Arch Ind Hyg Occup. 1954 Vol 10 pp 61-68 Data source: ECHA web-site, Exp Supporting Acute toxicity: dermal.003
Unknown	Rabbit; strain, sex and no/group are not specified	DCPD No data on analytical purity and physical state	Unknown	LD_{50} = 5080 mg/kg bw	Toxicol. Appl. Pharmacol., 20, 552, (1971); Data source: OECD SIDS

Table 27b: Summary table of human data on acute dermal toxicity

Type of data/report	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
Signs and symptoms	DCPD	No data	Skin-redness and pain	IPCS, CEC; International Chemical Safety Card on Dicyclopentadiene. (October 2005). Available from, as of October 03, 2006 Data source: HSDB

Table 27c: Summary table of other studies relevant for acute dermal toxicity

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on acute dermal toxicity

The dermal toxicity of DCPD was evaluated in one OECD Guideline 402 study in rats (GLP compliant) and two studies in rabbits conducted with methods equivalent or similar to OECD Guideline 402, non-GLP. Another study lacks of details and is not considered sufficiently reliable for classification. Human data on acute dermal toxicity has insufficient details on conditions of exposure and can be used only as a supportive data.

The study 1989-01-17 is well performed and most reliable (OECD Guideline 402, GLP compliant) for classification purposes, but the result gives the range of values without upper limit: the acute dermal LD_{50} of 75% DCPD in the rat was greater than 2000 mg/kg bw. To consider the possibility of assigning the substance to Category 5 (2000 ≤ ATE < 5000 mg/kg bw), the additional data and confirmation is needed. Thus, the study from publication (1962) conducted with methods equivalent or similar to OECD Guideline 402 in New Zealand White rabbits (male) with the LD_{50} value of 4460 mg/kg is considered as a key study for the pilot exercise purposes.

Comparison with the GHS criteria

The LD_{50} value of 4460 mg/kg bw (New Zealand White rabbit, male) is within the range of values (2000 ≤ ATE < 5000 mg/kg bw) supporting a classification in Category 5 for acute dermal toxicity according to the GHS criteria.

Conclusion on classification and labelling for acute dermal toxicity

Classification with Category 5 for acute dermal toxicity is proposed.

Symbol: No symbol
Signal word: Warning
Hazard statement: H313: May be harmful in contact with skin.

Acute toxicity - inhalation route

Table 28a: Summary table of animal studies on acute inhalation toxicity

Method, test guideline, and deviation(s) if any	**Species, strain, sex, no/group**	**Test substance, reference to table 5, form and particle size (MMAD)**	**Dose levels, duration of exposure**	**Value LC_{50}**	**Reference**
equivalent or similar to OECD Guideline 403 Deviations: yes, 6 hour exposure GLP compliant	B6C3F1 mouse, male/female; No. of mice per sex per dose: 6	DCPD ~97% endo- and ~1% cyclopentadiene, Physical state: liquid at room temperature	46, 130, 260 and 557 ppm; Duration of exposure: 6 h Route of administration: inhalation: vapour	LC_{50} (male) = 143 ppm; Remarks = 774 mg/m^3 air (analytical) Calculated LC_{50} on 4 hour using Haber laws and n=3: LC_{50} = 0.886 mg/L LC_{50} (female) = 130 ppm; Remarks = 703 mg/m^3 (analytical) Calculated LC_{50} on 4 hour using Haber laws and n=3: LC_{50} = 0.804 mg/L LC_{50} (male/female) = 738.5 mg/m^3 air (analytical)=0.738 mg/L Calculated LC_{50} on 4 hour using Haber laws and n=3: LC_{50} =0.845 mg/L	Author not specified. Report date 1981-04-29 Data source: ECHA web-site, Exp Key Acute toxicity: inhalation.004

equivalent or similar to OECD Guideline 403 Deviations: yes, 6 hour exposure GLP compliant	Fischer 344 rat, male/female; No. of rats per sex per dose: 6	DCPD ~97% endo- and ~1% cyclopentadiene, Physical state: liquid at room temperature	46, 130, 260 and 557 ppm; Duration of exposure: 6 h Route of administration: inhalation: vapour	LC_{50} (male) = 284 ppm Remarks = 1536 mg/m³ air (analytical) Calculated LC_{50} on 4 hour using Haber laws and n=3: LC_{50} = 1.587 mg/L LC_{50} (female) = 353 ppm Remarks = 1910 mg/m³ air (analytical) Calculated LC_{50} on 4 hour using Haber laws and n=3: LC_{50} = 2.186 mg/L LC_{50} (male/female) = 1723 mg/m³ air (analytical) = 1.723 mg/L Calculated LC_{50} on 4 hour using Haber laws and n=3: LC_{50} = 1.972 mg/L	Author not specified. Report date 1981-04-29 Data source: ECHA web-site, Exp Key Acute toxicity: inhalation.002
equivalent or similar to OECD Guideline 403 Non-GLP	Albino rat, male/female; No. of rats per sex per dose: 6	98.3% DCPD, Isomeric mixture of endo/exo form in a 95:5 ratio Physical state: liquid	Dose levels not specified; Duration of exposure: 4 h Route of administration: inhalation: vapour	LC_{50} (male) = 359.4 ppm = 1943 mg/m^3 = 1.943 mg/L LC_{50} (female) = 385.2 ppm = 2083 mg/m^3 = 2.083 mg/L	Author not specified. Publication (1971) Data source: ECHA web-site, Exp Supporting Acute toxicity: inhalation.001
equivalent or similar to OECD Guideline 403 Deviations: yes, 1 dog/group Non-GLP	Beagle dog, female No. of animals per sex per dose: 1	98.3 % DCPD, Isomeric mixture of endo/exo form in a 95:5 ratio Physical state: liquid	68, 272, 458 and 773 ppm (measured); Duration of exposure: ca. 1 ca. 4 h Route of administration: inhalation: vapour	LC_{50} (female) = 458 - 773 ppm LC_{50} (female) = 2478 - 4181 mg/m³ air	Author not specified. Publication (1971) Data source: ECHA web-site, Exp Supporting Acute toxicity: inhalation.003

equivalent or similar to OECD Guideline 403 Non-GLP	Mouse, male; strain not specified; No. of animals per sex per dose: 6	DCPD, 98.3 %; Isomeric mixture of endo/exo form in a 95:5 ratio Physical state: liquid	Dose levels not specified; Duration of exposure: 4 h Route of administration: inhalation: vapour	LC_{50} (male) = 145.5 ppm LC_{50} (male) = 787 mg/m³ air (analytical)= 0.787 mg/L	Author not specified. Publication (1971) Data source: ECHA web-site, Exp Supporting Acute toxicity: inhalation.006
equivalent or similar to OECD Guideline 403 Deviations: yes, rabbit Non-GLP	Rabbit, male; strain not specified; No. of animals per sex per dose: 4	DCPD, 98.3 %; Isomeric mixture of endo/exo form in a 95:5 ratio Physical state: liquid	Dose levels not specified; Duration of exposure: 4 h Route of administration: inhalation: vapour	LC_{50} (male) = 771 ppm Remarks = 4171 mg/m^3 (analytical)	Author not specified. Publication (1971) Data source: ECHA web-site, Exp Supporting Acute toxicity: inhalation.005
Unknown	Rat; strain, sex and no/group are not specified	DCPD No data on analytical purity and physical state	Dose levels not specified; Duration of exposure: 4 h Route of administration: inhalation: unspecified	LC_{50} = 1000 ppm/4H	Brit.J. Industr. Med., 27,1 (1970); Data source: OECD SIDS
Unknown	Rat; strain, sex and no/group are not specified	DCPD No data on analytical purity and physical state	Dose levels not specified; Duration of exposure: 4 h Route of administration: inhalation: unspecified	LC_{50} = 660 mg/L	Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987., p. A716/Aug 87 Data source: HSDB

Unknown	Rat; strain, sex and no/group are not specified	DCPD No data on analytical purity and physical state	Dose levels not specified; Duration of exposure: 4 h Route of administration: inhalation: unspecified	LC_{50} = 500 ppm	Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39 Data source: HSDB
Unknown	Mouse; strain, sex and no/group are not specified	DCPD No data on analytical purity and physical state	Dose levels not specified; Duration of exposure: 4 h Route of administration: inhalation: unspecified	LC_{50} = 145 ppm	Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39 Data source: HSDB
Unknown	Guinea pig; strain, sex and no/group are not specified	DCPD No data on analytical purity and physical state	Dose levels not specified; Duration of exposure: 4 h Route of administration: inhalation: unspecified	LC_{50} = 770 ppm	Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39 Data source: HSDB

Table 28b: Summary table of human data on acute inhalation toxicity

Type of data/report	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
Signs and symptoms	DCPD	No data	Inhalation – cough, sore throat, and headache	IPCS, CEC; International Chemical Safety Card on Dicyclopentadiene. (October 2005). Available from, as of October 03, 2006 Data source: HSDB

Table 27c: Summary table of other studies relevant for acute inhalation toxicity

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on acute inhalation toxicity

The acute inhalation toxicity of DCPD (vapour) was evaluated in six studies conducted with methods equivalent or similar to OECD Guideline 403 in different species. Two of these studies have a deviations in time exposure and, thus, these are not directly applicable to evaluation of acute inhalation, but it is possible to calculate LC_{50}'s for 4 h exposures using Haber's law with recommended n=3 as the extrapolation is to shorter duration. The calculated LC_{50} values for 4 h in mice are 0.886 mg/L (male), 0.804 mg/L (female) and 0.845 mg/L (male/female). The calculated LC_{50} values for 4 h in rats are 1.587 mg/L (male), 2.186 mg/L (female) and 1.972 mg/L (male/female). In the most reliable study among the studies performed by the method equivalent or similar to OECD Guideline 403 without deviations in time exposure the LC_{50} in Albino rats (male/female) was 359.4 ppm (male) and 385.2 ppm (female) equivalent to 1.943 and 2.083 mg/L, respectively.

Comparison with the GHS criteria

The calculated 4-hour LC_{50} values from the most reliable studies (equivalent or similar to OECD Guideline 403, GLP compliant) dated 1981-04-29 conducted with mice and rats are 0.804 mg/L (mice, female) and 1.587 mg/L (rats, male) warrant classification in Category 2 for acute inhalation toxicity according to the GHS criteria (the range of values for classification in Category 2 for vapour is $0.5 \leq ATE < 2.0$ mg/L). The LC_{50} value of 1.943 mg/L (Albino rat, male) provides further support for classification in Category 2.

Conclusion on classification and labelling for acute inhalation toxicity

Classification with Category 2 for acute inhalation toxicity is proposed.
Symbol: Skull and crossbones
Signal word: Danger
Hazard statement: H330: Fatal if inhaled.

8.2 Skin corrosion/irritation

Table 29a: Summary table of animal studies on skin corrosion/irritation

Method, test guideline, and deviation(s) if any	**Species, strain, sex, no/group**	**Test substance, reference to table 5**	**Dose levels, duration of exposure**	**Results** **-Observations and time point of onset** **-Mean scores/animal** **-Reversibility**	**Reference**
OECD Guideline 404 GLP compliant	New Zealand White rabbit, sex not specified; Number of animals: 3	75% DCPD Physical state: liquid	Type of coverage: semi-occlusive Amount/ concentration applied: 0.5 mL Duration of treatment / exposure: 4 hours	Observation period: 7 days. Irritation parameter: erythema score Basis: mean Time point: 24, 48 & 72 h Score: 2 Max. possible score: 4 Reversibility: fully reversible within: 7 days. Remarks: possible hyperkeratinisation at 7 days in all 3 animals. Irritation parameter: edema score Basis: mean Time point: 24, 48 & 72 h Score: 2.3 Max. possible score: 4 Reversibility: fully reversible within: 7 days.	Author not specified. Report date 1989-01-17 Data source: ECHA web-site, Exp Key Skin irritation/corrosion.002

equivalent or similar to OECD Guideline 404 Deviations: yes, study pre-dates guideline. Principles of method if other than guideline: Primary skin irritation Non-GLP	New Zealand White rabbit, sex not specified; Number of animals: 5	DCPD No data on analytical purity and physical state	Type of coverage: non-occlusive Amount/concentration applied: 0.01 mL (not stated if undiluted or solution) Duration of treatment / exposure: 24 hours	Irritation parameter: overall irritation score Basis: mean Time point: 24 h Score: 5 Max. possible score: 10 Remarks: moderate irritant Grade 1 indicated no irritation and Grade 2, the least visible capillary injection from the undiluted chemical. Responses above grade 6 indicated necrosis.	Author not specified. Publication (1962) Data source: ECHA web-site, Exp Supporting Skin irritation/corrosion.001
Unknown	New Zealand White rabbit, sex not specified; Number of animals: 3	75% DCPD No data on physical state	Type of coverage: semi-occlusive Amount/ concentration applied: 0.5 mL Duration of treatment / exposure: 4 hours	Observation period: 14 days Well-defined erythema was observed within 3 days of exposure in all animals. Signs of keratinization were observed on day 7. Moderate edema was observed at 24 hours in all animals, and regressed to slight by day 3. The primary irritation index was 4.7	TSCATS OTS0558246; Data source: US EPA Screening-level hazard characterization Document
Test method: Open irritation test Non-GLP	Rabbit, sex, strain and no/group not specified	DCPD No data on analytical purity and physical state	Not specified	No details; Result: Highly irritating	Achiev. Ind. Hyg. Occp. Med., 10, 61 (1954) Data source: OECD SIDS
Standard Draize test Non-GLP	Rabbit, sex, strain and no/group not specified	DCPD No data on analytical purity and physical state	Amount/concentration applied: 20 mg Duration of treatment / exposure: 24 hours	No details; Result: Moderate irritating	RTECS Database (Prehled Prumyslove Toxikologie 50 (1986) Data source: OECD SIDS

Table 29b: Summary table of human data on skin corrosion/irritation

Type of data/report	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
Not specified	DCPD	Not specified	DCPD causes mild to severe eye, skin, and respiratory tract irritation, and severe response of the eyes and skin result from 24-hour exposure	Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:38 Data source: HSDB
Not specified	DCPD	Not specified	... Eye and skin irritation from the undiluted material is relatively minor	American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2005., p. 1 Data source: HSDB

Table 29c: Summary table of other studies relevant for skin corrosion/irritation

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on skin corrosion/irritation

In the most reliable study (OECD Guideline 404, GLP compliant) dated 1989-01-17 with 75% DCPD, well-defined erythema and slight to severe oedema was present at skin sites of all New Zealand White rabbits at 24, 48 and 72 hour observations. On day 7 no oedema was noted but there were signs of possible hyperkeratinisation. No other adverse dermal reactions were noted during the study. The overall mean scores (24, 48 & 72 hr) were 2 for erythema and 2.3 for oedema. Under the conditions of the test, the DCPD would be considered to be irritation to rabbit dermal tissue.

In another study conducted by a method equivalent or similar to OECD Guideline 404 in New Zealand White rabbits, the overall irritation score was 5 of 10 after 24 hours exposure that correspond to moderate irritation according to the provided grades explanation. However, the exposure period of 24 hours in this study exceeds the recommended exposure period considered for classification purposes according to GHS criteria.

The information on the study in New Zealand White rabbits (method is unknown) provided in US EPA Screening-level hazard characterization Document includes the similar signs of skin reaction as in report dated 1989-01-17 from ECHA web-site but with less details. At the same time the slight difference in details (Observation period: 7 days in entry 1 and 14 days) is presented. The US EPA refers to TSCATS OTS0558246, but this source is publicly unavailable and, thus, it is not possible to confirm that if this data duplicate information on ECHA web-site (report 1989-01-17, Author not specified) or not. Hence it

appears that the information from TSCATS OTS0558246 should be mentioned separately but it can be used only as supportive data for the classification purpose because of the low details.

The 1954 study reported in rabbits by open irritation test doesn't provide any details on method or findings, thus, the result of this study considered as not reliable for the classification purpose.

The 1986 study reported by Standard Draize test in rabbits provides low level of study details of method without any details of findings. Furthermore, the exposure period of 24 hours in this study exceeds the recommended exposure period for classification purposes according to GHS criteria.

Human data were obtained from the reliable peer reviewed sources, but the primary sources of these data are unavailable and, thus, the information should be used carefully. This information supports skin irritation potential of a DCPD, but it can not serve as a sole basis for classification.

Comparison with the GHS criteria

GHS criteria for skin irritation Category 2: Mean score of ≥ 2.3 and ≤ 4.0 for erythema/eschar or for oedema in at least 2 of 3 tested animals from gradings at 24,48 and 72 hours after patch removal or, if reactions are delayed, from grades on 3 consecutive days after the onset of skin reactions;
Based on defined edema with score 2.3 at skin sites of all New Zealand White rabbits at 24, 48 and 72 hour observations from the most reliable study (1989-01-17), classification with Category 2 is proposed for skin irritation.

Conclusion on classification and labelling for skin corrosion/irritation

Classification with Category 2 is proposed for skin irritation.
Symbol: Exclamation mark
Signal word: Warning
Hazard statement: H315: Causes skin irritation

8.3 Serious eye damage/eye irritation

Table 30a: Summary table of animal studies on serious eye damage/eye irritation

Method, test guideline, and deviation(s) if any	Species, strain, sex, no/group	Test substance, reference to table 5	Dose levels, duration of exposure	Results -Observations and time point of onset -Mean scores/animal -Reversibility	Reference
OECD Guideline 405 GLP compliant	New Zealand White rabbit; sex not specified. Number of animals: 3	75% DCPD Physical state: liquid	Amount/ concentration applied: 0.1 mL Single application	Observation period: 7 days Irritation parameter: cornea score Basis: mean Time point: 24- 72 h Score: 0 Max. possible score: 4 Irritation parameter: iris score Basis: mean Time point: 24- 72 h Score: 0 Max. possible score: 2 Irritation parameter: conjunctivae score Basis: mean Time point: 24- 72 h Score: 0.43 Max. possible score: 3 Reversibility: fully reversible within: 7 days Remarks: slight redness present in 1 animal at 72 h. Irritation parameter: chemosis score Basis: mean Time point: 24- 72 h Score: 0.1 Max. possible score: 4 Reversibility: fully reversible within: fully reversible within: 48 h Remarks: slight chemosis in 1 rabbit at 24 h	Author not specified. Report date 1989-01-17 Data source: ECHA web-site, Exp Key Eye irritation.002

Draize eye irritation test with irrigation after application Non-GLP	New Zealand White rabbit Number of animals:9	98-99% pure DCPD Physical state: waxy solid, liquefied on slight warming	Amount(s) applied (volume or weight with unit): 0.1 mL Duration of treatment / exposure: 3 rabbits : eye washed at 2 seconds after application 3 rabbits : eye washed at 4 seconds after application 3 rabbits: eyes not washed	Observation period: 14 days Irritation parameter: conjunctivae score Basis: mean Time point: 24, 48, 72 h Score: 0.89 Max. possible score: 3 Reversibility: fully reversible within: 3 days Remarks: eye not irrigated Irritation parameter: conjunctivae score Basis: mean Time point: 24, 48, 72 h Score: 0.22 Max. possible score: 3 Reversibility: fully reversible within: 3 days Remarks: eye irrigated at 2 seconds Irritation parameter: conjunctivae score Basis: mean Time point: 24, 48, 72 h Score: 0.78 Max. possible score: 3 Reversibility: fully reversible within: 3 days Remarks: eye irrigated at 4 seconds	Author not specified. Report date 1976-06-24 Data source: ECHA web-site, Exp Supporting Eye irritation.001
Open irritation test Non-GLP	Rabbit; strain, sex, no/group not specified	DCPD No data on analytical purity and physical state	Dose: 500 mg Duration of exposure not specified	Result: irritating	Smyth et al. Range finding toxicity data: List VI. Am. Med. Assoc. Archives of. Ind. Hyg. Occp. Med., 10, 61 (1954) Data source: OECD SIDS

Standard Draize test Non-GLP	Rabbit; strain, sex, no/group not specified	DCPD No data on analytical purity and physical state	Dose: 500 mg Duration of exposure: 24h	Result: moderate irritating.	RTECS Database (Prehled Prumyslove Toxikologie 50 (1986) Data source: OECD SIDS

Table 30b: Summary table of human data on serious eye damage/eye irritation

Type of data/report	**Test substance, reference to table 5**	**Relevant information about the study (as applicable)**	**Observations**	**Reference**
Study with volunteers Human sensory response	96.7% DCPD, isomeric mixture of endo/exo in a 95:5 ratio Physical state: liquid	Number of subjects exposed: 2 Age: 24-47 years Route of exposure: inhalation Exposure was in a glass-lined 12800 L room from which the vapour-air mixture was exhausted at 2500-3200 L/min.	During the 30-min exposure to 1 ppm, one subject experienced slight eye and throat irritation at 7 min and one subject reported olfactory fatigue after 24 min. No olfactory fatigue was reported by either subject during the 30-min exposure to 5.5 ppm DCPD vapour. Eye irritation was reported by one subject after 10 min at this concentration.	Author not specified. Publication 1971 Data source: ECHA web-site, Exposure related observations in humans: Direct observations: clinical cases, poisoning incidents and other
Not specified	DCPD No data on analytical purity and physical state	Not specified	DCPD causes mild to severe eye, skin, and respiratory tract irritation, and severe response of the eyes and skin result from 24-hour exposure	Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:38 Data source: HSDB

Not specified	DCPD No data on analytical purity and physical state	Not specified	... Eye and skin irritation from the undiluted material is relatively minor	American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2005., p. 1 Data source: HSDB

Table 30c: Summary table of other studies relevant for serious eye damage/eye irritation

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on serious eye damage/eye irritation

Four studies in rabbit are available. The results of two of the studies (Open irritaition test 1954 and Standard Draize test 1986) support DCPD as an irritant to eyes. The dose and exposure reported in these two reports were 500 mg/24 hrs, other details of studies including scores were not available.

In GLP compliant OECD Guideline 405 study, eye irritation was assessed in 3 New Zealand white rabbits. 0.1 mL DCPD 75% was instilled into the conjunctival sac and the eyes were scored for irritation responses at 1, 24, 48 and 72 hours and at 7 days after instillation. At 1 hour, corneal dulling was present in 2 eyes, iridial inflammation and moderate conjunctival irritation were present in all 3 eyes, giving an overall mean score of 18.5 at 1 hour, which corresponds to moderate irritation (Kay and Callandra, 1962). Signs of irritation regressed to minimal in 2 eyes at 24 hours but persisted in 1 animal at 48 and 72 hours. All effects were fully reversible within 7 days. 75% DCPD was a moderate irritant to the rabbit eye at 1 hour but was practically non-irritating at 24, 48 and 72 hours.

In Draize eye irritation test with irrigation after application eye irritation was assessed in 3 New Zealand white rabbits. 0.1 mL DCPD was instilled into the conjunctival sac and the eyes were scored for irritation responses at 1, 2, 3, 4, 7 and 14 days after instillation. Some irritation of the conjunctivae was observed in 7 of the 9 rabbits following instillation. Irritation was reduced but not prevented by irrigation 2 or 4 seconds after application. In all cases, irritation was confined to the conjunctivae and all eyes were normal by the third day. DCPD was practically non-irritating at 24, 48 and 72 hours.

One of two human volunteers experienced slight eye irritation at 7 min of 30-min exposure to 1 ppm of 96.7% DCPD in human sensory response study 1971. After 10 min of 30-min exposure to 5.5 ppm DCPD vapour eye irritation was reported by one volunteer. Although these data are from a small number of

exposed people, the severity of effect was slight and there is no information that irritation was long lasting, thus these data are considered as reliable but not sufficient for classification purposes.

There is also human data with lack of details of exposure. According to Bingham, E.,Cohrssen, B. and Powell, C.H. (2001) DCPD causes mild to severe eye, skin, and respiratory tract irritation, and severe response of the eyes and skin result from 24-hour exposure. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values mentioned that "... Eye and skin irritation from the undiluted material is relatively minor". These data were obtained from the reliable peer reviewed sources, but the primary sources of these data are unavailable and, thus, the information should be used carefully. This information supports eye irritation potential of a DCPD, but it can not serve as a basis for classification.

Comparison with the GHS criteria

Table 3.3.2 of the GHS provides the following criteria for serious eye damage/eye irritation:

	GHS Criteria
	Substances that have the potential to induce reversible eye irritation
Category 2/2A	Substances that produce in at least 2 of 3 tested animals a positive response of: (a) corneal opacity ≥ 1; and/or (b) iritis ≥ 1; and/or (c) conjunctival redness ≥2; and/or (d) conjunctival oedema (chemosis) ≥ 2 calculated as the mean scores following grading at 24,48 and 72 hours after instillation of the test material, and which fully reverses within an observation period of normally 21 days.
Category 2B	Within category 2A an eye irritant is considered mildly irritating to eyes (Category 2B) when the effects listed above are fully reversible within 7 days of observation

Based on reliable GLP compliant OECD Guideline 405 study and Draize eye irritation test with irrigation after application as a supportive study it is proposed not to classify DCPD as serious eye damage/eye irritant.

Conclusion on classification and labelling for serious eye damage/eye irritation

Not classified.

8.4 Respiratory or skin sensitisation

Respiratory sensitisation

Table 31a: Summary table of animal studies on respiratory sensitisation

Method, test guideline, and deviation(s) if any	**Species, strain, sex, no/group**	**Test substance, reference to table 5**	**Dose levels, duration of exposure**	**Results**	**Reference**
No data available.					

Table 31b: Summary table of human data on respiratory sensitisation

Type of data/report	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Table 31c: Summary table of other studies relevant for respiratory sensitisation

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on respiratory sensitisation

No data available.

Comparison with the GHS criteria

It is not possible to compare with the GHS criteria because there is no data available.

Conclusion on classification and labelling for respiratory sensitisation

Not classified.

Skin sensitisation

Table 32a: Summary table of animal studies on skin sensitisation

Method, test guideline, and deviation(s) if any	Species, strain, sex, no/group	Test substance, reference to table 5	Dose levels, duration of exposure	Results	Reference
OECD Guideline 406 (Modified Buehler test) GLP compliant	Dunkin-Hartley guinea pig, female; No. of animals per dose: 12	75% DCPD Physical state: liquid	Dose level: undiluted liquid: A. INDUCTION EXPOSURE No. of exposures: 9 Exposure period: 6 hours Test groups: yes Control group: yes Site: an area on the shoulder Frequency of applications: on	Results of test: Reading: 1st reading Hours after challenge: 24 Group: test group Dose level: undiluted test material No. with + reactions: 0 Total no. in group: 12 Reading: 2nd reading Hours after challenge: 48 Group: test group Dose level: undiluted test material	Author not specified. Report date 1989-01-17 Data source: ECHA web-site, Exp Key Skin sensitisation. 002

			days 0, 2, 4, 7, 9, 11, 14 16 and 18 Concentrations: 0.5 mL of undiluted test material B. CHALLENGE EXPOSURE No. of exposures: 1 Day(s) of challenge: 10 Exposure period: 6 hours Test groups: yes Control group: yes Site: an area of flank Concentrations: 0.2 mL of undiluted test material Evaluation (hr after challenge): Approximately 24 and 48 hours after patch removal Route of exposure: epicutaneous, occlusive	No. with + reactions: 0 Total no. in group: 12 Reading: 1st reading Hours after challenge: 24 Group: negative control Dose level: blank patch No. with + reactions: 0 Total no. in group: 12 Reading: 2nd reading Hours after challenge: 48 Group: negative control Dose level: blank patch No. with + reactions: 0 Scattered mild redness was commonly seen at the induction sites during the induction phase. Other adverse skin reactions were fissuring, dry, thickened, straw-coloured skin (possible hyperkeratinisation), loss of skin suppleness, superficial cracking of the skin and small superficial scattered scabs. These reactions sometimes precluded evaluation of erythema. No signs of skin irritation were noted in control animals during induction. No skin responses were noted in test or control animals at 24 or 48 hours after challenge.	
Draize test Non-GLP Deviations: intracutaneous injection	Guinea pig; strain and sex are not specified. No. of animals per dose: 8	98-99% DCPD Physical state: waxy solid, liquefied on slight warming	Concentration: 0.1 % w/v A. Induction exposure: 3 weeks B. Challenge exposure: single dose	Results of test: Reading: 1st reading Hours after challenge: 24 Group: test group Dose level: 0.1% w/v No. with + reactions: 0 Total no. in group: 8 Clinical observations: mild erythema Reading: 2nd reading Hours after challenge: 48 Group: test group Dose level: 0.1% w/v No. with + reactions: 0 Total no. in group: 8 Clinical observations: mild erythema Reading: 1st reading Hours after challenge: 24 Group: positive control	Author not specified. Report date 1976-06-24 Data source: ECHA web-site, Exp Supporting Skin sensitisation. 001

				Dose level: 2,4-DNCB No. with + reactions: 4 Total no. in group: 4 Clinical observations: marked skin reactions Reading: 2nd reading Hours after challenge: 24 Group: positive control Dose level: 2,4-DNCB No. with + reactions: 4 Total no. in group: 4 Clinical observations: marked skin reactions	

Table 32b: Summary table of human data on skin sensitisation

Type of data/report	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Table 32c: Summary table of other studies relevant for skin sensitisation

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on skin sensitisation

In a modified (9 induction) Beuhler test (GLP compliant) in female guinea pigs, there were no skin responses following challenge with undiluted DCPD 75%w. 75% DCPD is therefore considered to be non-sensitising to guinea pig skin.

In a Draize test in guinea pigs, 0.1% DCPD was shown to be non-sensitising following intracutaneous challenge.

Comparison with the GHS criteria

There were no positive responses in studies with rabbits according to OECD Guideline 406. Human data is not available.

Conclusion on classification and labelling for skin sensitisation

Not classified.

8.5 Germ cell mutagenicity

Table 33a: Summary table of mutagenicity/genotoxicity tests in vitro

Method, test guideline, and deviation(s) if any	Test substance, reference to table 5	Relevant information about the study including rationale for dose selection (as applicable)	Observations	Reference
OECD Guideline 476 EU Method B.17 EPA OTS 798.5300 GLP compliant	95% DCPD Physical state: liquid	Species/strain/ cell line: mouse lymphoma L5178Y cells Metabolic activation: with and without Metabolic activation system: PB/BNF S9 fraction prepared in-house from the livers of male Sprague-Dawley rats following three consecutive daily doses of phenobarbital/ß-naphthoflavone (80/100 mg/kg bw/day). Test concentrations: 0, 5.16, 10.31, 20.63, 41.25, 82.5, 165, 330, 660, 1320 µg/mL (initial toxicity test) 10, 15, 20, 25, 30, 35 µg/mL (expt 1: 4h -S9) 10, 20, 30, 40, 50, 60 µg/mL (expt 1: 4h +S9) 5, 10, 20, 30, 40, 50 µg/mL (expt 2: 24h -S9) 10, 20, 30, 40, 45, 50 µg/mL (expt 2: 4h +S9) Vehicle: DMSO Exposure duration: 4 hours (24 hours in experiment 2 in the absence of S9) Expression time (cells in growth medium): 2 days Selection time (if incubation with a selection agent): 10-14 days Selection agent (mutation assays): 5-trifluorothymidine	Result: Genotoxicity: negative Cytotoxicity: yes There was evidence of marked toxicity following exposure to the test item in the absence and presence of S9. Near optimum levels of toxicity were achieved in the absence of S9, but not in the presence of S9, despite a narrow concentration selection, due to the steep toxicity curve. A dose level that exceeded the upper limit for toxicity was plated for viability and TFT resistance as sufficient cells were available. The vehicle controls had MF that were considered acceptable for the L5178Y cell line at the TK +/- locus. Both positive controls induced marked increases in mutant frequency. The test item did not induce any statistically significant or dose-related increases in the mutant frequency, either in the absence or presence of S9.	Study report 2014. Author not specified. Data source: ECHA website - Exp Key Genetic toxicity in vitro.004
equivalent or similar to OECD Guideline 471 (Bacterial	98-99% DCPD Physical state: liquid	Species/strain: other: S. typhimurium, TA98, TA100, TA1535, TA1537, TA1538 Metabolic activation: with and without	Genotoxicity: negative Cytotoxicity: yes toxic at 5 µL/plate	Author not specified. Report (1980) Data source: ECHA web-

Reverse Mutation Assay) with deviations: E.coli was not included in the test Non-GLP		Metabolic activation system: Aroclor induced rat liver S9 Non-activated: 0.001, 0.01, 0.1, 1.0 or 5.0 µL/plate Activated: 0.001, 0.01, 0.1, 1.0, 5.0 or 10 µL/plate The plates were incubated for 48 hours at 37°C, and scored for the number of colonies growing on each plate.		site, Exp Supporting Genetic toxicity in vitro.001
Bacterial reverse mutation assay acc. to OECD Guideline 471 acc. to EU Method B.13/14 GLP compliant	75% DCPD Physical state: liquid	Species/strain: - S. typhimurium TA 1535, TA 1537, TA 98 and TA 100; - E. coli WP2 uvr A. Metabolic activation: with and without Metabolic activation system: S9 from Arochlor 1254 induced rat liver. Dose range 1-666 µg/plate. Preincubation period: 30 minutes Exposure duration: 48 hours; Number of replications: 2	Species/strain: S. typhimurium TA 1535, TA 1537, TA 98 and TA 100 Metabolic activation: with and without Genotoxicity: negative Cytotoxicity: yes Species/strain: E. coli WP2 uvr A Metabolic activation: with and without Genotoxicity: negative Cytotoxicity: yes	Author not specified. Report date 2000-03-08 Data source: ECHA web-site, Exp Key Genetic toxicity in vitro.002
Japan Guidelines for Screening Mutagenicity Testing Of Chemicals GLP compliant	95% DCPD Physical state: unspecified	Species/strain: Chinese hamster lung (CHL/IU) cells. Metabolic activation: with and without Metabolic activation system: Rat liver (strain not specified). Phenobarbital and 5,6-benzoflavone induced (Treatment not specified). First experiment: 24 and 48 hour continuous treatment (-S9): 0.0, 0.014, 0.029, 0.057 mg/mL Second experiment: 24 hour continuous treatment (-S9): 0.0, 0.029, 0.043, 0.057 mg/mL Short-term treatment: (-S9): 0.0, 0.014, 0.029, 0.057 mg/mL (+S9): 0.0, 0.03, 0.05, 0.10 mg/mL Number of replications: 2 cultures per dose level	DCPD did not induce structural chromosomal aberrations or polyploidy in CHL/IU cells up to a concentration causing more than 50% cell growth inhibition with or without metabolic activation. Structural chromosomal aberrations were marginally induced at the highest dose –S9, 0.057mg/mL, after 24 hr continuous exposure. Result: Genotoxicity: negative Cytotoxicity: yes	1) Author not specified. Information sheet (1998) & Report date 1993-12-31 2) MHW, Japan (1997) Data source: 1) ECHA web-site, Exp Key Genetic toxicity in vitro.005; 2) OECD SIDS, MHW, Japan

equivalent or similar to OECD Guideline 480 (Genetic Toxicology: Saccharomyces cerevisiae, Gene Mutation Assay) Non-GLP	98-99% DCPD Physical state: liquid	Species/strain: Saccharomyces cerevisiae. Metabolic activation: with and without Metabolic activation system: Aroclor induced rat liver S9 Test concentrations: Non-activated: 0.001, 0.01, 0.1, 1.0 or 5.0 µL/plate Activated: 0.001, 0.01, 0.1, 1.0, 5.0 or 10 µL/plate. The plates were incubated for 48 hours at 37°C, and scored for the number of colonies growing on each plate.	Genotoxicity: negative Cytotoxicity: yes toxic at 5 µL/plate	Author not specified. Report (1980) Data source: ECHA web-site, Exp Supporting Genetic toxicity in vitro.003
Salmonella/ microsome preincubation assay Non-GLP	DCPD No data on analytical purity and physical state	Species/strain: Salmonella typhimurium strains (TA98, TA100, TA1535, and TA1537) Doses: 0, 3, 10, 33, 100, and 333 ug/plate Metabolic activation: with and without Metabolic activation system: Aroclor-induced rat or hamster liver S9	DCPD was negative in these tests and the highest ineffective dose level tested without clearing of the background lawn in any Salmonella tester strain was 100 ug/plate. Result: Genotoxicity: negative	1) Zeiger E et al; Environ Mutagen 9: 1-110 (1987) 2) US EPA Genetox Program (1988) Data source: 1) HSDB 2) OECD SIDS
Method preincubation Test unknown Non-GLP	DCPD No data on analytical purity and physical state	Species/strain: - S. typhimurium TA98, TA100, TA1535, TA1537, TA1538; - E. coli WP2UVRA. Metabolic activation: with and without Metabolic activation system: rat liver S-9, phenobarbital and beta-naphthoflavone. Dose range 1.56-400 µg/plate Vehicle(s)/solvent(s) used: DMSO.	Result: Genotoxicity: negative	Japan Chemical Industry Ecology-Toxicology And Information Center, Japan; mutagenicity test data of existing chemical substances based on the toxicity investigation of the Industrial Safety And Health Law; 1996 Data source: CCRIS

Table 33b: Summary table of mutagenicity/genotoxicity tests in mammalian somatic or germ cells in vivo

Method, test guideline, and deviation(s) if any	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
Micronucleus assay acc. to OECD Guideline 474, EPA OPPTS 870.5395 and EU Method B.12 GLP compliant	Dicyclopentadiene/ Codimer Concentrate CAS: 68478-10-4 29.175 wt % endo- and exo-DCPD 18.726 wt % C4-MCPD and C5-MCPD codimers 13.210 wt % MCPD dimer 12.903 wt % CPD-MCPD codimer 8.129 wt % C8 aliphatic and aromatic hydrocarbons 7.144 wt % C4-CPD and C5-CPD codimers 3.625 wt % MCPD-C7 dimer 2.771 wt % Tetrahydroindene 1.917 wt % Trimers 0.927 wt % C7 cyclic hydrocarbon 0.697 wt % C5 acyclic hydrocarbon dimer 0.634 wt % MCPD monomer 0.078 wt % CPD monomer 0.063 wt % C6 acyclic hydrocarbons Physical state: liquid	Test animals: Crl:CD-1®(ICR)BR mouse, male/female Doses / concentrations: 0, 437.5, 875, or 1750 mg/kg body weight Two doses at an approximate 24-hour interval No. of animals per sex per dose: 5/sex/group (0, 437.5, or 875 mg/kg body weight and positive controls), 7/sex/group (1750 mg/kg body weight).	Test results: Genotoxicity: negative Clinical signs observed in male and female animals at 1750 mg/kg included ataxia, lethargy, and hyperactivity. In addition, male animals exhibited spasms, and female animals exhibited ruffled fur, prostration, and hyperreactivity. No clinical signs of toxicity were observed in male or female animals at 875 or 427.5 mg/kg. An 18% and 14% decrease in terminal body weight was observed for the high dose males and females, respectively, as compared with their initial body weights The terminal body weight loss for the high dose groups, as compared with the controls, was 18% for males and 13% for females. Both observed body weight reductions are considered test substance-related signs of systemic toxicity. The body weight loss in males is also considered biologically significant. No statistically significant or biologically relevant effects on micronuclei frequencies were observed in the bone marrow cells in any dose group treated with DCPD/Codimer Concentrate. Although not statistically significant, a depression of approximately 30% in the PCE/NCE ratio was seen at 1750 mg/kg in females The vehicle and positive control groups exhibited a response consistent with the laboratory's historical control data. The positive control, cyclophosphamide, induced a significant increase in the frequency of micronucleated PCEs ($p < 0.05$).	Author not specified. Report date 2004-07-25 Data source: ECHA web-site, Exp Supporting Genetic toxicity in vivo

Table 33c: Summary table of human data relevant for germ cell mutagenicity

Type of data/report	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on germ cell mutagenicity

There are seven studies of mutagenicity or genotoxicity *in vitro* available. All of tests results are negative. Only one *in vivo* study with Dicyclopentadiene/ Codimer Concentrate (CAS: 68478-10-4) contained ~ 30% DCPD and ~70% similar hydrocarbon substances is available which shows negative result. DCPD did not demonstrate mutagenic activity with or without metabolic activation.

Comparison with the GHS criteria

GHS criteria for Categories of germ cell mutagens are based on positive evidence from human epidemiological studies, positive result(s) from *in vivo* or *in vitro* tests or positive evidence obtained from experiments in mammals and /or *in vitro* experiments.

There were no positive results reported in mutagenic tests with DCPD.

Conclusion on classification and labelling for germ cell mutagenicity

Not classified.

8.6 Carcinogenicity

Table 34a: Summary table of animal studies on carcinogenicity

Method, test guideline, and deviation(s) if any	Species, strain, sex, no/group	Test substance, reference to table 5	Dose levels, duration of exposure	Results	Reference
Unknown	Rat; strain, sex and no/group are not specified	DCPD No data on analytical purity and physical state	Unspecified. Route of administration – intramuscular	There were no findings of carcinogenic properties of DCPD	Rosenblatt et al. (1975): NTIS Rep. No. AD-AO 30 428, J1-8. Data source: ECHA website – NS NS Carcinogenicity. 001

Table 34b: Summary table of human data on carcinogenicity

Type of data/report	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Table 34c: Summary table of other studies relevant for carcinogenicity

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Table 34d: Are the following factors taken into consideration in the hazard assessment? - No

Reference	Species and strain	Tumour type and background incidence	Multi-site responses	Progression of lesions to malignancy	Reduced tumour latency	Responses in single or both sexes	Confounding effect by excessive toxicity?	Route of exposure	MoA and relevance to humans
No applicable.									

Short summary and overall relevance of the provided information on carcinogenicity

There is only one study report on carcinogenicity of DCPD that is available. There were no findings of carcinogenic properties of DCPD in this study, but as there is no information of method used, GLP compliance, dose levels and other details, the result can't be used for evaluation and classification purposes.

Comparison with the GHS criteria

GHS criteria for Categories of carcinogens are based on positive evidence obtained from human and/or animal studies. There is only one study report on carcinogenicity of DCPD that is available and the results found no evidence of carcinogenic properties of DCPD. However, this study can't be used for classification purposes because of low details (unknown method, dose concentration etc). Based on absence data on carcinogenicity and absence of mutagenic activity of DCPD confirmed *in vivo* and *in vitro* studies (see section 8.5) no classification is warranted for DCPD on carcinogenicity.

Conclusion on classification and labelling for carcinogenicity

Not classified.

8.7 Reproductive toxicity

Adverse effects on sexual function and fertility

Table 35a: Summary table of animal studies on adverse effects on sexual function and fertility

Method, test guideline, and deviation(s) if any	Species Strain Sex no/group	Test substance, reference to table 5	Dose levels duration of exposure	Results	Reference
OECD Guideline 422 GLP compliant	Sprague-Dawley rat, male/ female; No. of animals per sex per dose: 10	94.65% DCPD Physical state: liquid	Doses / concentrations: 0, 4, 20 or 100 mg/kg/day Duration of exposure: Males 44 days; Females from 14 days before mating through gestation and parturition until day 3 of lactation	Effect levels: Endpoint: NOAEL Generation: F1 Effect level: 20 mg/kg bw/day (nominal) Clinical signs and mortality: yes, two females in the high dose (100 mg/kg bw) group died. The following major observations were noted: lung congestion, enlargement of the adrenal gland, and bleeding of the gastric mucosa and thymus. Body weight and food consumption: yes, males and surviving females showed slight suppression of body wt gain and decreased food consumption. Reproductive function: estrous cycle: not examined Reproductive function: sperm measures: not examined Reproductive performance : no effects Organ weights: yes, there were increased liver and kidney weights in male rats given 100 mg/kg Gross pathology: no effects Histopathology: yes, in male rats given 100 mg/kg, single cell necrosis in liver, and hyaline droplets and basophilic changes in tubular epithelium of kidneys was seen. Increase in fatty droplets in fascicular zone of	Author not specified. Information sheet date1998-03-30 Report date 1993-12-31 Data source: ECHA website - Exp Key Toxicity to reproduction.003

				adrenals was observed in both males and females in the 100 mg/kg bw group. Similar histopathological changes were seen in kidneys of 4, 20 mg/kg bw group male rats and in adrenals of 20 mg/kg bw group male rats. Other findings: Blood chemistry of high dose males showed increase in GOT and GPT; no test material related changes occurred in haematology parameters for any treatment group.	
equivalent or similar to OECD Guideline 416 Deviations: yes, three generation study Non-GLP	Sprague-Dawley rat, male/ female; No. of animals per sex per dose: 10 males, 20 females	98-99% DCPD	Doses / concentrations: 0, 80, 750 ppm (nominal in diet) 0, 69.3 or 693 ppm (analytical conc.) Duration of treatment / exposure: For 7 weeks prior to mating of the F0 parents through to study termination.	Effect levels: Endpoint: NOAEL Sex: male/female Effect level: 80 - 750 ppm (69 - 693 ppm actual concentration) equivalent to 60 mg/kg bw/day Clinical signs: no effect Body weight and food consumption: yes, mean food consumption at 20 weeks in the F1B parents was reduced in both sexes in a treatment-related manner, with statistical significance at the high level. Reproductive function: estrous cycle: not examined Reproductive function: sperm measures: not examined Reproductive performance: at high dose female fertility was reduced in the F2A and F2B generations, however, the differences from control were not statistically significant and this may have been due to one male in the 750 ppm group that failed to sire litters in either mating.Organ weights: not examined Gross pathology: no effects Histopathology: not examined No gross structural abnormalities /malformations were seen in pups of any generation	Author not specified. Report (1980) Data source: 1) ECHA website - Exp Supporting Toxicity to reproduction.002 2) ECETOC publication. JACC No. 19

Reproducti-ve Assessment by Continuous Breeding Protocol (NTP, 1989) GLP compliant	Sprague-Dawley rat, male/ female; No. of animals per sex per dose: 20	DCPD No data on analytical purity and physical state	Doses / concentrations: 10, 30, and 100 mg/kg bw/day Duration of treatment / exposure: from one week prior to mating through to study termination.	Reproductive toxicity was observed in the 100 mg/kg bw group females: 28% fewer F1 pups born live, 8% lower adjusted live F1 pup weights, higher F1 pup mortality, increased cumulative days to litter, and decreased F1 pup survival in the final litter. At 30 mg/kg there was a 4% decrease in the female pup weight. Result of crossover mating: pup weight was reduced (9%), in the DCPD-treated females, while no effects were observed in litters from DCPD-treated males. Necropsy: DCPD caused a 2%, 7%, and 17% increase in liver weights and a 16%, 15%, and 16% increase in kidney weights in males from the 10, 30, and 100 mg/kg bw groups, respectively. Microscopically: an increase in the incidence of clear cell foci was observed in the livers of 30 and 100 mg/kg bw rats. In the second generation, DCPD at 100 mg/kg bw caused a 12% reduction in F2 pup weight in the presence of increased F1 liver and kidney weights. The reproductive effects of DCPD were not greater than those observed in the first generation.	Jamieson, H.M., Delaney, J.C., Wolfe, G.W. and Chapin, R.E. (1995) "Reproductive effects of dicyclopentadiene in S-D rats assessed by a continuous breeding protocol." The Toxicologist. 15:166. Abstract No. 880 Data source: 1) HSDB2) ECHA website - Exp Supporting Toxicity to reproduction.001

Table 35b: Summary table of human data on adverse effects on sexual function and fertility

Type of data/report	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Table 35c: Summary table of other studies relevant for toxicity on sexual function and fertility

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on adverse effects on sexual function and fertility

According to report dated 1993-12-31 and information sheet dated 1998-03-30, in OECD Guideline 422 study, 94.65% DCPD induced systemic toxicity (slight suppression of body weight gain and decreased food consumption) in male and female rats at 100 mg/kg bw/day dose level. Lethality in 2/10 dams with evidence of lung congestion, enlargement of the adrenal gland, and bleeding of the gastric mucosa and thymus was reported at high dose level No compound-related effects were seen on reproductive parameters such as mating index, fertility index, gestation length, number of corpora lutea or implantations, implantation index, gestation index, delivery index or parturition. However two dams in the 100 mg/kg group had total litter loss during the lactation period. It is likely that these are the females that died, but not specified in report. A low viability index and tendency to lower birth wt and body wt gain was observed in neonates in the highest dose group (100 mg/kg bw) but not at lower dose levels. As these adverse effects were seen only at a dose level causing marked systemic toxicity, these are not considered relevant for classification purposes.

In OECD Guideline 416 study report (1980) dietary administration of DCPD at nominal concentrations of 80 and 750 ppm to three successive generations of male and female albino rats had no deleterious effects on reproductive performance or general condition of the animals, in comparison to performance of control rats maintained concurrently. However, DCPD was not devoid of reproductive or systemic effects at the high dietary level. Mean food consumption at 20 weeks in the F1B parents was reduced in both sexes in a treatment-related manner, with statistical significance at the 750 ppm level. At 750 ppm, female fertility was reduced in the F2A and F2B generations, however, the differences from control were not statistically significant, and this may have been due to one male in the 750 ppm group that failed to sire litters in either mating. No evidence of dose-related developmental effects was seen in pups of any generation.

In the reproductive assessment by continuous breeding protocol/oral gavage study conducted by NTP in rats, reproductive toxicity (increased days to litter, increased pup mortality, fewer pups born alive and lower pup weights) were noted in the presence of slight maternal toxicity (increased liver weight) at 100 mg/kg body weight/day indicating that DCPD affected intrauterine and post natal survival of the pups. Only limited information is available about the study and the full report could not be obtained.

Comparison with the GHS criteria

According to the GHS criteria the Category 2 for reproductive toxicity includes “substances for which there is some evidence from humans or experimental animals, possibly supplemented with other information, of an adverse effect on sexual function and fertility, or on development, in the absence of other toxic effects, or if occurring together with other toxic effects the adverse effect on reproduction is considered not to be a secondary non-specific consequence of the other toxic effects, and where the evidence is not sufficiently convincing to place the substance in Category 1”.

No classification is proposed for fertility as no clear effects on fertility (except for an increase in days to litter in the continuous breeding NTP study in rats) are available.

Adverse effects on development of the offspring

Table 36a: Summary table of animal studies on adverse effects on development of the offspring

Method, test guideline, and deviation(s) if any	**Species, strain, sex, no/group**	**Test substance, reference to table 5**	**Dose levels, duration of exposure**	**Results**	**Reference**
OECD Guideline 422 GLP compliant	Sprague-Dawley rat, male/ female; No. of animals per sex per dose: 10	94.65% DCPD Physical state: liquid	Doses / concentrations: 0, 4, 20 or 100 mg/kg bw/day Duration of exposure: Males 44 days; Females from 14 days before mating through gestation and parturition until day 3 of lactation	Viability: yes, reduced viability index in the pups in the high dose group Clinical signs (pups): no effects Clinical signs and mortality(parental animals): yes, two females in the high dose (100 mg/kg bw) group died. The following major observations were noted: lung congestion, enlargement of the adrenal gland, and bleeding of the gastric mucosa and thymus. Body weight (pups): yes, tendency to lower birth wt and body wt gain was observed in neonates in the high dose group Sexual maturation: not examined Organ weights (pups): not examined Gross pathology (pups): not examined Histopathology (pups): not examined	Author not specified. Information sheet date 1998-03-30. Report date 1993-12-31. Data source: ECHA website - Exp Key Toxicity to reproduction.003
equivalent or similar to EPA OPP 83-3 (Prenatal Developmental Toxicity Study) Non-GLP	Sprague-Dawley rat, female; No. of animals per sex per dose: 20	98-99% DCPD	Doses / concentrations: 0, 80, 250, 750 ppm Duration of treatment / exposure: Days 6-15 of gestation Duration of test: Days 0-19 of gestation	Effect levels: Endpoint: NOAEL Effect type: maternal toxicity Effect level: 750 ppm (nominal) Maternal toxic effects: no effects Embryotoxic / teratogenic effects: no effects Any other information on results incl. tables: 750 ppm equivalent to 60 mg/kg bw/day based on a 250 g rat consuming 20 g diet/day There was no evidence of teratogenicity or developmental toxicity at this dose.	Author not specified. Report (1978) Data source: ECHA website - Exp Key Developmental toxicity/ teratogenicity.003

Dose range finding study Non-GLP	New Zealand White rabbit, sex unspecified, No. of animals per sex per dose: 10	98% DCPD	Doses / concentrations: 0, 25, 100, 200, 300 or 400 mg/kg bw/day Duration of treatment / exposure: Days 6-19 of gestation Frequency of treatment: Daily Duration of test: 30 days	Effect levels: Endpoint: NOAEL Effect type: maternal toxicity Effect level: 25 mg/kg bw/day (nominal) Endpoint: NOAEL Effect type: developmental toxicity Effect level: 300 mg/kg bw/day Maternal toxic effects: yes, three of the 10 rabbits given 400 mg/kg bw/day and 1 given 300 mg/kg bw/day were found dead (days 21-23) in the post dosing period. Effects on dams:In the 100 mg/kg bw/day group, one rabbit aborted on day 18, another had bloody vaginal discharge beginning on day 26 of gestation but was pregnant at scheduled necropsy. In the 300 mg/kg group, 1 rabbit had a bloody vaginal discharge beginning on day 19 of gestation, aborted 4 kits on day 21 with an additional 9 masses on gestational day 22. Three animals in the 400 mg/kg bw/day group had blood vaginal discharges; 2 recovered over several days, one was dead on gestation day 23. Maternal body weight loss during the treatment period was dose-related and statistically significant for the 200, 300 and 400 mg/kg bw/day groups. Decreased food and water consumption were observed in all animals given 300 or 400 mg/kg bw/day.	Author not specified. Report date 1993-08-11 Data source: ECHA website - Exp Supporting Developmental toxicity/ teratogenicity.001; US EPA; HSDB
				Embryotoxic / teratogenic effects: yes, the number of resorptions and non-live implants/litter were higher, and the number of foetuses was lower, in the 400 mg/kg bw/day group compared to controls but were not statistically significant.	

				Two litters from this group showed gross deformities of foetuses – one with eyes open and 1 with eyes open and deformed hind limbs in one litter of 3 live pups, and eyes open in all foetuses from another 400 mg/kg bw /day litter. Dicyclopentadiene caused maternal lethality at 300 and 400 mg/kg/day, maternal toxicity at 200 mg/kg/day and possibly the abortion of 1 litter at 100 mg/kg. No developmental endpoints were affected by treatment at dose levels of 200 mg/kg/day or less although no foetal examination was conducted.	
Dose range finding study Non-GLP	Sprague Dawley CD(SD)BR rat, sex unspecified. No. of animals per sex per dose: 11	98% DCPD	Doses / concentrations: 0, 50, 200, 300, 400 or 500 mg/kg bw/day Duration of treatment / exposure: Days 6-15 of gestation. Duration of test: 20 days	Maternal toxic effects: yes, all animals in the 400 and 500 mg/kg bw/day groups were found dead by GD 9. Eight and 3 animals in the 300 and 200 mg/kg bw/day groups respectively, were found dead or were killed for humane reasons by GD 9. All animals in the 50 mg/kg bw/day group survived to scheduled termination. Signs of systemic toxicity were noted in all animals given 200 mg/kg bw/day group or more, from GD 7. Clinical signs included dried material around nose and mouth, rough hair coat, and lethargy increased in severity with increasing dose. Other signs included convulsions (1 rat given 200 mg/kg bw/day), hunched posture (6 rats given 300 mg/kg bw/day) and ataxia (5 rats given 300 mg/kg bw/day, 11 rats given 400 mg/kg bw/day and 9 rats given 500 mg/kg bw/day). Maternal body weights of the treated animals were decreased in a dose-related manner. These differences were statistically different ($p<0.05$) from the control group during the treatment period in the 50 mg/kg bw/day group and during the treatment and post-treatment period in the 200 mg/kg bw/day	Author not specified. Report date 1993-02-04 Data source: ECHA website - Exp Supporting Developmental toxicity/ teratogenicity.002

				group. Embryotoxic / teratogenic effects: yes, only the control, 50 and 200 mg/kg bw/day groups had litters with live foetuses at scheduled necropsy on day 20. Average foetal weight in the 200 mg/kg bw/day group was significantly decreased ($p<0.05$) compared to the control group; the mean number of live foetuses was unaffected by treatment. A NOAEL for maternal toxicity was not established in this study and is therefore, 50 mg/kg bw/day. However, this dose level was a NOAEL for developmental toxicity based on average foetal weight only. No foetal examination was included in this study.	

Table 36b: Summary table of human data on adverse effects on development of the offspring

Type of data/report	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Table 36c: Summary table of other studies relevant for adverse effects on development of the offspring

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on adverse effects on development of the offspring

One GLP compliant study on adverse effects on development of the Sprague-Dawley rats offspring are available. No significant differences in number of offspring, live offspring at birth, sex ratio or live birth index were found. No abnormal findings were observed in external features, clinical signs in offspring, or at necropsy of offspring.

Administration of DCPD by incorporation into the diet at 80, 250 and 750 ppm in EPA OPP 83-3 study (1980) produced no effect on pregnant SD rats when fed on days 6-15 of gestation. There was no evidence of teratogenicity or developmental toxicity at this dose.

In dose range finding study report dated 1993-08-11, in the 100 mg/kg bw/day dose group, two dams experienced either total litter abortion or bloody vaginal discharge that may indicate embryo/fetal death in

rabbits. Abortion and bloody vaginal discharge was also noted in the 300 and 400 mg/kg bw/day dose groups, although none were reported in the 200 mg/kg bw/day dose group. Within the 300 and 400 mg/kg bw/day dose groups, there was significant maternal toxicity, including death while minimal body weight effects were noted at 200 mg/kg bw/day dose group. There were no any maternal toxic effects in the 100 mg/kg bw/day dose group. The spontaneous incidence of abortion or bloody vaginal discharge in rabbits is relatively low, suggesting that these events were treatment related. Spontaneous abortion is a relatively rare event in control rabbits. Spontaneous abortion can be induced by severe maternal toxicity as the dam is unable to continue the pregnancy due to the decreases in feed and water consumption and changes in physiology that occur in response to severe toxicity. There were no such signs reported at 100 mg/kg bw/day dose group and, thus, it can be concluded that there were no maternal toxic effects in the 100 mg/kg bw/day dose group. Spontaneous abortion also occurs with no or minimal maternal toxicity when the conceptuses die *in utero*. The intrauterine death of the embryo or fetus results in a decreased signal to the dam that is required for the pregnancy to be maintained and the lack of this signal allows for changes in maternal physiology that results in the failure to maintain the pregnancy. In this instance, the increased incidence of spontaneous abortion forms a dose response curve extending into the dose range that includes a lack of evidence of maternal toxicity (100 mg/kg bw/day). This suggests a direct effect of the chemical on the survival of the embryo or fetus rather than an indirect effect through maternal toxic mechanisms. At the higher dose levels where significant maternal toxicity was present, it is certainly possible that the spontaneous abortions were due to a combination of maternal toxicity and a direct effect on the conceptus. It was reported that no developmental endpoints were affected by treatment at dose levels of 200 mg/kg bw/day or less although no foetal examination was conducted. Developmental effects at the high-dose level included increased numbers of resorptions and non-live implants/litter and decreased number of fetuses. Two litters from does treated with 400 mg/kg bw/day showed gross deformities of kits; 1 with eyes open and 1 with eyes open and deformed hind limbs in 1 litter of 3 total live kits, and eyes open in all 12 kits from another high-dose litter. But according to the GHS criteria (item 3.7.2.4.4 (a), "maternal mortality greater than 10% is considered excessive and the data for that dose level should not normally be considered for further evaluation" and provided above data on mortality (three of the ten rabbits given 400 mg/kg-day), adverse effect on development of the offspring are not relevant for classification purposes. There were no other effects on gravid uterine weight, number of implantation sites, resorptions, dead fetuses and live fetuses in the other treated groups.

In dose range finding study report dated 1993-02-04, dose levels of 200, 300, 400 and 500 mg/kg bw/day were lethal to pregnant rats when given from day 6 of gestation. Signs of systemic toxicity were noted in all animals given 200 mg/kg bw/day group or more, from GD 7. Clinical signs included dried material around nose and mouth, rough hair coat, lethargy, hunched posture and ataxia. Maternal body weights were decreased in a dose-related manner. All animals given 50 mg/kg bw/day survived to termination of the study; maternal bodyweights were significantly lower than the controls during the treatment period. Only the control, 50 and 200 mg/kg bw/day groups had litters with live foetuses at necropsy on GD20. Foetal weight in the 200 mg/kg bw/day group was significantly decreased but there was no similar effect of 50 mg/kg bw/day. The mean number of live foetuses was unaffected by treatment. A NOAEL for maternal toxicity was not established in this study and is therefore, 50 mg/kg bw/day. However, this dose level was a NOAEL for developmental toxicity based on average foetal weight only. No foetal examination was included in this study.

Comparison with the GHS criteria

According to the GHS criteria the Category 2 for reproductive toxicity includes "substances for which there is some evidence from humans or experimental animals, possibly supplemented with other information, of an adverse effect on sexual function and fertility, or on development, in the absence of other toxic effects, or if occurring together with other toxic effects the adverse effect on reproduction is

considered not to be a secondary non-specific consequence of the other toxic effects, and where the evidence is not sufficiently convincing to place the substance in Category 1".

A rabbit developmental toxicity dose range finding study found an increased incidence of pregnancy loss/spontaneous abortion in 2/10 dams at the dose levels of 100 mg/kg bw/day and above with maternal toxicity observed at the 200 mg/kg bw/day dose level and above. Based on these data and finding of reproductive toxicity (increased days to litter, increased pup mortality, fewer pups born alive and lower pup weights) noted in the presence of slight maternal toxicity (increased liver weight) at 100 mg/kg bw/day in the rapid assessment by continuous breeding protocol/oral gavage study conducted NTP in rats, the DCPD is proposed to classify as reproductive toxicant Category 2 for developmental toxicity.

Adverse effects on or via lactation

Table 37a: Summary table of animal studies on effects on or via lactation

Method, test guideline, and deviation(s) if any	**Species, strain, sex, no/group**	**Test substance, reference to table 5**	**Dose levels, duration of exposure**	**Results**	**Reference**
No data available.					

Table 37b: Summary table of human data on effects on or via lactation

Type of data/report	**Test substance, reference to table 5**	**Relevant information about the study (as applicable)**	**Observations**	**Reference**
No data available.				

Table 37c: Summary table of other studies relevant for effects on or via lactation

Type of study/data	**Test substance, reference to table 5**	**Relevant information about the study (as applicable)**	**Observations**	**Reference**
in vivo study	DCPD, purity unknown, and radiocarbon-labelled (uniform [14C], 62.6 mg/mCi) samples were used	Blood samples, urine, faeces and milk were collected at intervals. The cow was killed 96 hours after dosing with [14C] DCPD and several tissues were taken. Excretion and tissue retention were determined. cattle, Jersey, female, single dose, 10 mg/kg bw, oral: capsule Vehicle: no	Radiocarbon was quite rapidly excreted following oral dosing of [14C] DCPD. (c.a. 81% of administered [14C] eliminated in urine, c.a. 4% in faeces, <0.1% secreted into milk). Bioaccessibility: Only exceedingly low levels of radiocarbon appeared in milk, and residues were not detected in samples collected more than 48 hr post-treatment.	Publication of Ivie GW and Oehler DD: Fate of dicyclopentadiene in a lactating cow. Bull. Environm. Contam. Toxicol. 24, 662-670 (1980 year) Data source: ECHA web-site - Exp Supporting Basic toxicokinetics.004

Short summary and overall relevance of the provided information on effects on or via lactation

No relevant data available. The information provided in study with labeled DCPD in cattles noted that only exceedingly low levels of radiocarbon appeared in milk, but this information is insufficient to judge the ability of the substance to enter the breast milk.

Comparison with the GHS criteria

Comparison with the GHS criteria is not possible because there is no relevant data available.

Conclusion on classification and labelling for reproductive toxicity

Classification with Category 2 for developmental toxicity is proposed.
Symbol: Health hazard
Signal word: Warning
Hazard statement: H361: Suspected of damaging the unborn child.
Data are available only by oral route and the route of exposure cannot be specified in the hazard statement.

8.8 Specific target organ toxicity-single exposure (STOT SE)

Table 38a: Summary table of animal studies relevant for STOT SE

Method, test guideline, and deviation(s) if any	Test substance, reference to table 5	Species, strain, sex, no/group	Route of exposure	Dose levels, duration of exposure	Results	Reference
OECD Guideline 401 GLP compliant	DCPD 75% Physical state: liquid	Sprague-Dawley rat, male/ female; No. of animals per sex per dose: 5	oral: gavage	Doses: 500, 794, 1260 and 2000 mg/kg bw Duration of exposure: single dose Duration of observation period following administration: 14 days	Mortality: All deaths occurred one or two days following dosing. There were 2, 4, 5 and 5 male deaths and 1, 2, 5 and 5 female deaths in the 500, 794, 1260 and 2000 mg/kg bw/day groups respectively. Clinical signs: Hunched posture, piloerection, lethargy and decreased respiratory rate were present in all animals during the day of dosing. Ptosis was occasionally noted in animals dosed with 794 or 1260 mg/kg bw during this period. All rats dosed with 2000 mg/kg bw had ptosis 1 and 4 hours after dosing with occasional signs of ataxia at the 4 hour observation. Vocalisation was noted in one rat dosed with 1260 mg/kg bw at the 4 hour observation. Red/brown staining around the snout was present in surviving animals treated with 500 or 794 mg/kg bw one day after dosing. All survivors appeared normal 2 days after dosing. Body weight: All surviving animals showed expected body weight gain. Gross pathology: Haemorrhagic lungs, dark liver and sloughing of the non-glandular gastric epithelium were seen in decedents. No abnormalities were seen in animals killed at the end of the study.	Author not specified. Report date 1989-01-17 Data source: ECHA web-site, Exp Key Acute toxicity: oral.001

equivalent or similar to OECD Guideline 401 Non-GLP	98-99% pure DCPD Physical state: waxy solid, liquefied on slight warning	Swiss Webster mice, male/female No. of animals per sex per dose: 10	oral: gavage	Doses: 167, 215, 278, 360, 464 and 600 mg/kg bw Duration of exposure: single dose Duration of observation period following administration: 14 days	Mortality: All deaths occurred mainly one or two days following dosing. There were no female deaths reported at 165 mg/kg bw dose level. There were 5, 5, 6, 7, 8, and 10 male deaths and 0, 6, 3, 9, 5 and 9 female deaths in the 167, 215, 278, 360, 464 and 600 mg/kg bw groups respectively. Clinical signs: Decreased activity and prostration seen within 1-4 hours after dosing. Gross pathology: Gross findings in animals which died during the study included yellow fluid in the stomach and small intestines, distension of the bladder with pinkish-orange fluid, hyperaemia of the lungs and black discolouration of portions of the liver and spleen. There were no macroscopic abnormalities in animals that survived to the end of the study.	Author not specified. Report date 1976-06-24 Data source: ECHA website - Exp Supporting Acute Toxicity: oral.003
equivalent or similar to OECD Guideline 401 Non-GLP	98-99% pure DCPD Physical state: waxy solid, liquefied on slight warning	Sprague-Dawley rat, male/ female, No. of animals per sex per dose: 10	oral: gavage	Doses: 278, 360, 464, 600 and 793 mg/kg bw Duration of exposure: single dose Duration of observation period following administration: 14 days	Mortality: All deaths occurred mainly two days following dosing. There were 1, 2, 3, 8 and 8 male deaths and 0, 5, 7, 9 and 10 female deaths in the 278, 360, 464, 600 and 793 mg/kg bw groups respectively. Clinical signs: Red stains around the mouth and nose, decreased activity, occasional ataxia and prostration 1-4 hours after dosing. Some instances of convulsions and tremors were reported but not all of these rats later died. Gross pathology: Of those rats that died during the study, hyperaemia of the lungs was present in some but most showed no abnormalities. At necropsy of surviving rats, there were no gross abnormalities.	Author not specified. Report date 1976-06-24 Data source: ECHA website, Exp Supporting Acute Toxicity: oral.002

OECD Guideline 402 GLP compliant	75% DCPD Physical state: liquid	Sprague-Dawley rat, male/female No. of animals per sex per dose: 5	dermal: occlusive	Doses: >2000 mg/kg bw bodyweight Duration of exposure: 24 hours	Mortality: none Clinical signs: Vocalisation, lasting up to 30 minutes, noted in all animals after dosing. Hunched posture, lethargy, piloerection, erythema and oedema present in all animals on day 1. Isolated incidences of red/brown staining of snout and ptosis seen. All animals showed signs of eschar by day 3 which persisted until days 10 or 12. All treatment sites appeared normal by end of study. Body weight: All animals showed expected bodyweight gain. Gross pathology: No abnormalities were seen.	Author not specified. Report date 1989-01-17 Data source: ECHA website, Exp Key Acute toxicity: dermal.001
equivalent or similar to OECD Guideline 403 Deviations: yes 6 hour exposure GLP compliant	DCPD ~97% endo- and ~1% cyclopentadiene Physical state: liquid	B6C3F1 mouse, male/female No. of animals per sex per dose: 6	inhalation: vapour	Target concentration: 50, 150, 300 and 600 ppm. Actual exposure concentration: 46, 130, 260 and 557ppm.	NOAEC (male/female) for irregular breathing, stereotypic behaviour = 46 ppm Remarks = 248.74 mg/m3 Mortality: There were no deaths in males and females at 46 ppm exposure dose. There were 2 male deaths and 3 female deaths in 130 ppm groups. All animals were died in 260 and 557 ppm groups. Clinical signs: Male and female mice at 557 ppm showed loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, clear nasal discharge and deaths. At 260 ppm, both sexes showed stereotypic behaviour, respiratory difficulty, impaired gait, loss of coordination and convulsions prior to death. At 130 ppm, mice displayed irregular breathing and stereotypic behaviour; females also showed loss of coordination and slight tremors. No treatment-related clinical signs were observed in mice exposed to 46 ppm. Gross pathology: There were no gross pathological effects noted at necropsy.	Author not specified. Report date 1981-04-29 Data source: ECHA web-site, Exp Key Acute toxicity: inhalation.004

equivalent or similar to OECD Guideline 403 Deviations: yes 6 hour exposure GLP compliant	DCPD ~97% endo- and ~1% cyclopentadiene Physical state: liquid	Fischer 344 rat, male/ female No. of animals per sex per dose: 6	inhalation: vapour	Target concentration: 50, 150, 300 and 600 ppm. Actual exposure concentration: 46, 130, 260 and 557 ppm. Duration of observation period following administration: 14 days	NOAEC (male/female) for irregular breathing, stereotypic behaviour = 46 ppm Remarks = 248.74 mg/m3 Mortality: There were no deaths in males and females in 46 and 130 ppm groups. Two males were found dead the day after exposure of 260 ppm. All animals were died in 557 ppm groups. Clinical signs: Male and female rats at 557 ppm showed loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, nasal discharge, convulsions and death. At 260 ppm, both sexes showed stereotypic behaviour, respiratory difficulty and nasal discharge. In rats dying from exposure to dicyclopentadiene, convulsions were observed immediately before death. At 130 ppm, the only sign observed in both sexes, was a somewhat sluggish movement. No treatment-related clinical signs were observed in rats exposed to 46 ppm. In rats that did not die during the study, all clinical signs cleared by day 2. Gross pathology: There were no gross pathological effects noted at necropsy	Author not specified. Report date 1981-04-29 Data source: ECHA web-site, Exp Key Acute toxicity: inhalation.002
equivalent or similar to OECD Guideline 403 Non-GLP	98.3 % DCPD Physical state: liquid	Albino rat, male/ female, No. of animals per sex per dose: 6	inhalation: vapour	Concentrations: no data Duration of exposure: 4 h	Mortality: 1 male died at 272 ppm. Clinical signs: The lowest concentration at which effects were seen was 272 ppm where irritation of extremities was seen within 60 minutes in both males and females. Eye irritation, poor coordination and convulsions were generally observed prior to death. No other details were reported. Body weight: Survivors gained weight during the 14 day observation period. Gross pathology: No data	Author not specified. Publication (1971) Data source: ECHA web-site, Exp Supporting Acute toxicity: inhalation.001

equivalent or similar to OECD Guideline 403 Non-GLP	98.3 % DCPD Physical state: liquid	Beagle dog, female No. of animals per sex per dose: 1	inhalation: vapour	Concentrations: 68, 272, 458 and 773 ppm (measured concentrations) Duration of exposure: ca. 1 ca. 4 h	Mortality: After 1 hour exposure at 773 ppm one female died. Clinical signs: 773 ppm: irritation of eyes, nose and extremities within 30 minutes, followed by tonic and clonic convulsions preceding death within 60 minutes. 458 ppm: tremors within 15 minutes, with eye and nose irritation and lacrimation within 50 minutes, no death. 272 ppm: tremors within 180 minutes. 68 ppm (approximate): dog urinated small amounts, several times immediately following exposure. Body weight: No data Gross pathology: No data	Author not specified. Publication (1971) Data source: ECHA web-site, Exp Supporting Acute toxicity: inhalation.003

Table 38b: Summary table of human data relevant for STOT SE

Type of data/report	Test substance, reference to table 5	Route of exposure	Relevant information about the study (as applicable)	Observations	Reference
Study with volunteers Human sensory response test	DCPD 96.7%, isomeric mixture of endo/exo in a 95:5 ratio Physical state: liquid	inhalation	Exposure was in a glass-lined 12800 L room from which the vapour-air mixture was exhausted at 2500-3200 L/min. Number of subjects exposed: 3 (odour threshold), 2 (sensory response) Age: 24-47 years Subjects: blind to inhaled concentration	Clinical signs: Human sensory response test: During the 30-min exposure to 1 ppm, one subject experienced slight eye and throat irritation at 7 min and one subject reported olfactory fatigue after 24 min. No olfactory fatigue was reported by either subject during the 30-min exposure to 5.5 ppm DCPD vapour. Eye irritation was reported by one subject after 10 min at this concentration. One subject could taste DCPD for 1 hr after the 5.5 ppm exposure.	Author not specified. Publication (1971) Data source: ECHA website Direct observations: clinical cases, poisoning incidents and other

No data	DCPD No data on analytical purity and physical state	Inhalation	Unknown	Cough, sore throat, and headache	International Chemical Safety Card on Dicyclopentadiene. ICSC: 0873 (last update: July 1, 2014) Data source: IPCS providing by NIOSH

Table 38c: Summary table of other studies relevant for STOT SE

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on STOT SE

Oral route:

Based on LD_{50} value in Swiss Webster mice the DCPD is proposed to classify with Category 3 for acute toxicity via the oral route. There are three studies with useful information for STOT SE. Clinical signs provided in these studies like hunched posture, piloerection, lethargy, decreased activity and prostration, red stains around the mouth and nose are considered adaptive responses which are not relevant to classification. The gross findings in animals which died during the study include haemorrhagic lungs, dark liver and sloughing of the non-glandular gastric epithelium were seen in decedents this information, but no abnormalities were seen in animals killed at the end of the study. In the GLP compliant study performed according to OECD Guideline 401 all rats dosed with 2000 mg/kg bw of 75% DCPD had ptosis 1 and 4 hours after dosing with occasional signs of ataxia at the 4 hour observation. In other study (equivalent or similar to OECD Guideline 401, non-GLP) in rats with 98-99% DCPD clinical signs included occasional ataxia and prostration 1-4 hours after dosing. Some instances of convulsions and tremors were reported but not all of these rats later died. These evidences of transient effect on nervous system support classification for STOT SE 3 (narcotic effect)

Dermal route:

The DCPD is proposed to classify with Category 5 for acute dermal toxicity and Category 2 for skin corrosion/irritation. Available study (OECD Guideline 402, GLP compliant) did not provide any gross pathology in Sprague-Dawley rats. Clinical signs include vocalisation, lasting up to 30 minutes, noted in all animals after dosing. Hunched posture, lethargy, piloerection, erythema and oedema present in all animals on day 1. Isolated incidences of red/brown staining of snout and ptosis seen. All animals showed signs of eschar by day 3 which persisted until days 10 or 12. All treatment sites appeared normal by end of study. Thus there are no any significant evidences for specific organ toxicity which are not related to irritation properties and warrant classification for STOT SE 1 or STOT SE 2. The evidence of CNS depression in the absence of lethality support classification of DCPD for STOT SE 3 (narcotic effect)

Inhalation route:

The DCPD is proposed to classify with Category 2 for acute inhalation toxicity.

In the human sensory response test with the volunteers there is an evidence of throat irritation of one subject at 7 min. International Chemical Safety Card also provides information on cough, sore throat and

headache, but there are no details of exposure. Data from the animal study indicated an absence of gross pathology but the following clinical signs were observed: loss of righting reflex, impaired gait, stereotypic behavior, laboured breathing, nasal discharge, poor coordination. Evidence from human data and evidence of respiratory difficulty and CNS depression from animal study warrant DCPD classification with Category 3 for STOT SE (respiratory tract irritation and narcotic effect).

Comparison with the GHS criteria

The GHS criteria for respiratory tract irritation as Category 3 include respiratory irritant effects (characterized by localized redness, edema, pruritis and/or pain) that impair function with symptoms such as cough, pain, choking, and breathing difficulties are included. It is recognized that this evaluation is based primarily on human data.

Based on the evidence from human data and evidence of respiratory difficulty from animal study via inhalation it is proposed to classify DCPD with Category 3 for STOT SE (respiratory tract irritation).

The criteria for narcotic effects as Category 3 are narcotic effects observed in animal studies may include lethargy, lack of coordination righting reflex, narcosis, and ataxia. If these effects are not transient in nature, then they should be considered for classification as Category 1 or 2.

Based on the evidence of CNS depression in the absence of lethality reported in the acute toxicity studies it is proposed to classify DCPD with Category 3 for STOT SE (narcotic effect).

Conclusion on classification and labelling for STOT SE

Classification with Category 3 is proposed for STOT SE (respiratory tract irritation and narcotic effect).
Symbol: Exclamation mark
Signal word: Warning
Hazard statement: H335: May cause respiratory irritation.
H336: May cause drowsiness and dizziness.

8.9 Specific target organ toxicity-repeated exposure (STOT RE)

Table 39a: Summary table of animal studies relevant for STOT RE

Method, test guideline, and deviation(s) if any	Test substance, reference to table 5	Species, strain, sex, no/group	Route of exposure	Dose levels, duration of exposure	Results	Reference
equivalent or similar to OECD Guideline 422 GLP compliant	94.65% DCPD Physical state: liquid	Sprague Dawley Crj:CD(SD) rat, male/female No. of animals per sex per dose: 10	oral	Doses/concentrations: 0, 4, 20 or 100 mg/kg bw/day Duration of treatment / exposure: Males 44 days; Females from 14 days before mating through gestation and parturition until day 3 of lactation	NOAEL (males) = 4 mg/kg bw/day NOAEL (females) = 20 mg/kg bw/day *100 mg/kg bw/day:* - 2 females died; - transient salivation after for the initial 8 days of dosing was present in approximately half of the males and females; - blood chemistry of males showed increase in GOT and GPT; -increased weight of liver and kidneys of males (neither achieved statistical significance); - single cell necrosis in liver, and hyaline droplets and basophilic changes in tubular epithelium of kidneys under microscopic examination in males; -increase in fatty droplets in fascicular zone of adrenals in males/females - slightly decreased body weight and food consumption in males/females *20 mg/kg bw/day:* - histological changes in kidneys and adrenals in males; - occasionally salivation in males; - statistically significantly increased actual and relative liver weight in males	Author not specified. Information sheet date1998-03-30 Data source: ECHA website - Exp Key Repeated dose toxicity: oral.002

equivalent or similar to OECD Guideline 409 Non-GLP	98-99% DCPD Physical state: liquid	Beagle dog, male/ female, No. of animals per sex per dose: 4	oral: feed	Doses/concentrations: 0, 100, 300 and 1000 ppm Duration of treatment / exposure: 13 weeks	NOAEL (males/females) = 1000 ppm equivalent to 25 mg/kg bw/day There was no evidence of significant toxicity with the possible exception of minor indications of intestinal distress expressed as vomiting and soft stools among dogs of the treated groups, especially the highest dose. However, these signs were also occasionally observed among the control dogs. *Organ weights*: no effects *Gross pathology*: no effects	Author not specified. Report (1980) Data source: ECHA website - Exp Supporting Repeated dose toxicity: oral.001
Reproductive Assessment by Continuous Breeding Protocol (NTP, 1989) GLP compliant	DCPD No data on analytical purity and physical state	Sprague-Dawley rat, male/ female; No. of animals per sex per dose: 20	oral: gavage	Doses / concentrations: 10, 30, and 100 mg/kg bw/day Duration of treatment / exposure: from one week prior to mating through to study termination.	*Organ weights*: DCPD caused a 2%, 7%, and 17% increase in liver weights and a 16%, 15%, and 16% increase in kidney weights in males from the 10, 30, and 100 mg/kg bw/day groups, respectively. *Microscopically*: an increase in the incidence of clear cell foci was observed in the livers of 30 and 100 mg/kg bw/day rats.	Jamieson, H.M., Delaney, J.C., Wolfe, G.W. and Chapin, R.E. (1995) "Reproductive effects of dicyclopentadiene in S-D rats assessed by a continuous breeding protocol." The Toxicologist. 15:166. Abstract No. 880 Data source: HSDB

equivalent or similar to OECD Guideline 413 GLP compliant	DCPD 95% endo-DCPD, 0.5% exo-DCPD with several impurities of which only cyclopentadiene and isoprene were present at =0.5% Physical state: liquid	Fischer 344 rat, male/ female, No. of animals per sex per dose: 51	inhalation: vapour	Doses/concentrations: 0, 1, 5.1, or 51 ppm Frequency of treatment: 6 hours/day, 5 days/week for up to 13 weeks	NOAEC (females) = 50 ppm equivalent to 0.28 mg/L/ 6 hr/day NOAEC (males) Not established because of male rats-specific effects (protein accumulation, tubular hyperplasia (regeneration), tubular proteinosis, interstitial nephritis and glomerular basement thickening) which is presented in all exposed and control groups No evidence of systemic toxicity	Study report (1982) and publication Bevan C, Snellings W, Dodd D and Egan G "Subchronic Toxicity Study Of Dicyclopentadiene Vapour In Rats", 1992, Toxicol. Ind. Health Vol 8 (6) 353-367 Data source: ECHA website - Exp Key Repeated dose toxicity: inhalation.001

equivalent or similar to OECD Guideline 413 GLP compliant	DCPD 95% endo-DCPD, 0.5% exo-DCPD with several impurities of which only cyclopentadiene. and isoprene were present at =0.5% Physical state: liquid	B6C3F1 mouse, male/female No. of animals per sex per dose: 45	inhalation: vapour	Doses/concentrations: 0, 1, 5.1, 51 ppm Duration of treatment / exposure: 13 weeks Frequency of treatment: 6 hours/day, 5 days/week	NOAEC (males/females) = 5.1 ppm equivalent to 0.028 mg/L/ 6 hr/day *51 ppm:* -20 % mortality (10 males and 9 females) occurred in the high-dose mice during the study (not specified after what exposure period) - a few of the mice showed coordination loss and/or decreased activity (no further details) - significant elevation in body wt gain in males/females that returned to parity with control values during recovery - slight liver dysfunction and increased absolute and relative liver weights without morphological changes in females given 64 exposures *5.1 ppm:* - no more than 2 mice died - a few of the mice showed coordination loss and/or decreased activity (no further details) - slight liver dysfunction and increased absolute and relative liver weights without morphological changes in females given 64 exposures *1 ppm:* - no more than 2 mice died	Author not specified. Report (1982) Data source: ECHA website - Exp Key Repeated dose toxicity: inhalation.002

equivalent or similar to EPA OTS 798.2450 Non-GLP	96.7% DCPD, Isomeric mixture of endo/exo DCPD in a 95:5 ratio Physical state: liquid	Wistar rat, male/ female No. of animals per sex per dose: 12	inhalation: vapour	Doses/concentrations: 0, 19.7, 35.2 or 73.8 ppm Duration of treatment: 89 days Frequency of treatment: 7 hours/day, 5 days/week	NOAEC (male/female) < 19.7 ppm equivalent to < 0.107 mg/L/ 7 hr/day *73.8 ppm:* - one female had convulsions for about 5 min immediately after the exposure on day 19; - kidney lesions in males and in females (with less severity and frequency) with no further details - chronic pneumonia and bronchiectasis in 3 males *35.2 ppm:* - no convulsions were noted - kidney lesions in males and in females (with less severity and frequency) *19.7ppm:* - one female had convulsions for 5 min upon removal from the chamber on day 45	Author not specified. Publication (1971); Data source: ECHA website - Exp Supporting Repeated dose toxicity: inhalation.003
Unknown	DCPD No data on analytical purity and physical state	Beagle dog, male, No. of animals per sex per dose: unknown	inhalation: vapour	Doses/concentrations: 0, 8.9, 23.5, 32.4 ppm Duration of treatment: 89 days Frequency of treatment: 7 hours/day, 5 days/week.	Endpoint: NOAEC Effect level: 32.4 ppm = 0.19 mg/L No significant signs of toxicity were seen during or after the exposure period.	Kinkead, E.R. et al., Toxicol. Appl. Pharmacol., 20, 552 (1971) Data source: OECD SIDS

Table 39b: Summary table of human data relevant for STOT RE

Type of data/report	Test substance, reference to table 5	Route of exposure	Relevant information about the study (as applicable)	Observations	Reference
No data available.					

Table 39c: Summary table of other studies relevant for STOT RE

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
No data available.				

Short summary and overall relevance of the provided information on STOT RE

Three 90-day studies are considered reliable and relevant for STOT RE assessment.

In the first OECD Guideline 413 GLP compliant study Fischer 344 rats were exposed by inhalation to 0, 1, 5 or 50 ppm DCPD vapour 6 hr/day, 5 days/week for 13 weeks, followed by a 13-week recovery period. Animals were euthanized following completion of exposure at 2, 6, or 13 weeks and at post exposure weeks 4 or 13. No mortality, overt signs of toxicity, body weight changes, haematological or clinical chemistry values were related to exposure.

At 50 ppm, relative liver weights were significantly increased in males but with no accompanying histopathological changes. Males at this exposure level also showed alterations in renal function during the study (reduced urine specific gravity and urine osmolality, changes in sodium and potassium excretion rates and increased urine volume) which were not present during the recovery period.
The only histopathological findings were in the kidney, in male rats only, particularly those exposed to 5.1 or 51 ppm. Hyaline droplets accumulated in the proximal convoluted tubule during the exposure period and resolved during the recovery period. Males at 5.1 and 51 ppm also had protein accumulation, tubular hyperplasia (regeneration), tubular proteinosis, interstitial nephritis and glomerular basement thickening. These changes did not resolve by the end of the recovery period and were also seen in some males in the control and 1 ppm groups; they are consistent with a male, rat-specific, glomerulonephropathy, which is seen spontaneously in older male rats. The NOAEC for males and females was reviewed by Bevan et al, 1992 and was concluded to be 5.1 ppm (27.6 mg/m^3) for males (excluding the Hyaline droplet effect) and 51 ppm (276 mg/m^3) for females. However it is more likely that the NOAEC values for male rats couldn't be established because of the male rats-specific effects (protein accumulation, tubular hyperplasia (regeneration), tubular proteinosis, interstitial nephritis and glomerular basement thickening) which is presented in all exposed and control groups.

In the second OECD Guideline 413 GLP compliant study groups of 45 male and 45 female B6C3F1 mice were exposed by inhalation, 6 hr/day, 5 days/week, for 13 weeks (64 exposures) to DCPD vapour at concentrations of 0 (air control), 1, 5.1 or 51 ppm (analyzed concentrations). Animals were sacrificed after 10, 30 and 64 inhalation exposures and post exposure sacrifices were made at 29 and 92 days following the last exposure. Clinical observations, body weights, blood clinical chemistry and haematology, ophthalmology, organ weights and histopathology evaluations were made during the study. A number of statistically significant alterations were reported in this study but the aetiology and association with DCPD exposure are unclear and no further details were provided. Approximately 20 percent of mice (10 males and 9 females) exposed to 51 ppm (0.28 mg/L) died during the exposure regimen, however it is not reported after what certain exposure. According to the acute inhalation toxicity GLP compliant study (1981) performed equivalent or similar to OECD Guideline 403 there were no mice mortality following single 6-hour inhalation exposure at 46 ppm (0.25 mg/l) indicating that the mortalities in this study could be related to the repeated exposure rather than acute exposure. The cause of death was pulmonary congestion and possible renal failure, at the same time these effects were not found in animals terminated during the study. A potential effect of DCPD was seen in the female mice given 64 exposures to 51 or 5.1 ppm was a decrease in serum albumin indicative of slight liver dysfunction (7% difference from control);

absolute and relative liver weights were also increased. No morphological changes were found to indicate any effect of DCPD exposure. Thus any effect of DCPD on the livers of female mice was considered to be minimal in severity. The NOAEC is concluded to be 5.1 ppm (27.6 mg/m3).

In the third EPA OTS 798.2450 study groups of 12 male and 12 female Wistar rats were exposed by inhalation 7 hours/day, 5 days/week for 89 days to DCPD vapour at concentrations of 0, 19.7, 35.2 or 73.8 ppm. One female rat given 73.8 ppm had convulsions for about 5 min immediately after the exposure on day 19. Another female rat from the 19.7 ppm group had convulsions for 5 min upon removal from the chamber on day 45. No convulsions were observed among the 35.2 ppm rats. The 73.8 ppm concentration and, to a lesser degree, 35.2 ppm caused kidney effects such as round cell accumulations, dilated tubules, casts, and tubular degeneration; these kidney lesions were more frequent and of greater severity in the male than in the female rats.

There were chronic pneumonia and bronchiectasis reported in 3 males in the 73.8 ppm group with none in the controls; this is not a statistically significant finding (but may suggest some lung involvement associated with repeated inhalation of DCPD at this concentration). Other pathologic changes in the lungs were sporadic and not dose-related.

No dose-related pathologic changes of note were found in the heart, spleen, adrenal, trachea, prostate, testis, colon, and mesentery of rats from any dose group. Protein concretions were noted in the urinary bladder of males of all treatment groups and in controls, but none was found in females.

In a combined repeat dose toxicity study with reproduction/developmental toxicity screening according to OECD Guideline 422, groups of 10 male and 10 female rats were dosed by oral gavage with solutions of 0, 4, 20 or 100 mg/kg bw/day DCPD in olive oil. Animals were dosed for 2 weeks prior to mating and during mating (approximately 2 weeks). Males and females were then dosed through gestation until day 3 of lactation. Females were killed on day 4 of lactation and males were killed on day 45 of the study. Two out of ten females at 100 mg/kg bw/day died during the study (not reported at what day exactly) with evidence of lung congestion, enlargement of the adrenal gland, and bleeding of the gastric mucosa and thymus. Notwithstanding that there are no data on what day of study the mortality occurred, the effects is considered as related to repeated exposure based on the result of study (1976-06-24) performed equivalent or similar to OECD Guideline 401 and showed 5% mortality (1/20 rat on second day) at dose of 278 mg/kg bw/day. At the same time the lung congestion as repeated exposure related effect is questionable because hyperaemia of the lungs was also present in some rats died during the acute oral toxicity study on second/third day of exposure.

Surviving males and females in this study showed decreased food consumption and bodyweight gain at this dose level. Pathological changes in the liver and kidney were seen in males dosed at 100 mg/kg bw/day (single cell necrosis in the liver, hyaline droplet formation and basophilic changes in the tubular epithelium of the kidney) and an increase in fatty droplets in the adrenals was observed in both males and females in the 100 mg/kg bw/day group. Similar changes were seen in the kidney and adrenals of some male rats dosed at 20 mg/kg bw/day group male rats. As far as the result in kidney observed in OECD Guideline 413 GLP compliant study in Fischer 344 male rats is considered as rat-specific, the pathological changes in the kidney noticed in males during this study could be also rat-specific and not relevant for classification purpose.

In the assessment of reproductive toxicity by continuous breeding protocol/oral gavage study conducted by NTP in rats the autopsy showed that DCPD caused a 2%, 7%, and 17% increase in liver weights and a 16%, 15%, and 16% increase in kidney weights in males from the 10, 30, and 100 mg/kg groups, respectively. Microscopically, an increase in the incidence of clear cell foci was observed in the livers of 30 and 100 mg/kg bw/day rats. However, it is not clear from the data if these foci were induced by

treatment or occured spontaneously. The primary source of the report is unavailable and, thus, this information can be used with restriction.

Comparison with the GHS criteria

The found effects in kidney were recognized as rat-specific which were also seen spontaneously in older male rats and thus not sufficient for classification purposes. Any effect of DCPD on the livers of female mice was considered to be minimal in severity, but there was evidence of single cell necrosis in liver of male rats given 100 mg/kg of DCPD. An increase in the incidence of clear cell foci was observed in the livers of 30 and 100 mg/kg bw/day rats in continuous breeding protocol/oral gavage study conducted by NTP. However section 3.9.2.7 of the GHS doesn't include the single cell necrosis or the evidence of clear cell foci as effects considered to support classification.

The 20% mortality in mice by cause of pulmonary congestion and possible renal failure at 51 ppm (0.28 mg/L) reported in OECD Guideline 413 GLP compliant study is considered as related to repeated exposure that confirmed by absence of mice mortality following single 6-hour inhalation exposure at 46 ppm (0.25 mg/l) in GLP compliant study following OECD Guideline 403. The level of 51 ppm (0.28 mg/L) caused these effects is within recommended guidance values for classification (see Table 3.9.2) via inhalation (vapour) route of exposure: $0.2 < C \leq 1.0$ mg/litre/6h/d and warranted Category 2 for STOT RE.

The exposure dose of 100 mg/kg DCPD in a combined repeat dose toxicity study with reproduction/developmental toxicity screening caused 20% mortality (2/10) in female rats with evidence of lung congestion, enlargement of the adrenal gland, and bleeding of the gastric mucosa and thymus. Mortality in rats reported at 100 mg/kg bw/day that is the upper limit of the recommended guidance values ($10 < 100 \leq 100$ mg/kg bw/d via oral route of exposure) supporting the classification as Category 2 of STOT RE via oral and inhalation routes of exposure.

Thus, based on mortality in mice and rats it is proposed to classify DCPD with Category 2 for STOT RE.

Conclusion on classification and labelling for STOT RE

Classification with Category 2 is proposed for DCPD via oral and inhalation routes of exposure
Symbol: Health hazard
Signal word: Warning
Hazard statement: H373: May cause damage to organs through prolonged or repeated exposure via oral and inhalation routes of exposure

8.10 Aspiration hazard

Table 40: Summary table of evidence for aspiration hazard

Type of study/data	Test substance, reference to table 5	Relevant information about the study (as applicable)	Observations	Reference
	DCPD Purity unknown		0.736 cP (est) at 70 deg F (21.11 °C)	U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.
	DCPD Purity unknown		0.93 g/cm³ at 35 °C	CRC Press, Boca Raton, Handbook of Chemistry and Physics, 2008
Proprietary data	DCPD (>80%)		1-5 mPa.s at 20°C	2016 Data source: ECHA website
Proprietary data	DCPD with purity of 94%	The study is not GLP but followed guideline ASTM 445.	2.811 mm^2/s at 40°C	2016 Data source: ECHA website

Short summary and overall relevance of the provided information on aspiration hazard

There is one report available with data on kinematic viscosity of 94% DCPD measured at 40°C. The study is not GLP but followed guideline ASTM 445 and considered to be suitable to use. Comparison with the GHS criteria.

The GHS provides the following criteria for Category 1 for aspiration hazard: if it is hydrocarbon and has a kinematic viscosity ≤ 20.5 mm^2/s, measured at 40°C. The kinematic viscosity value of 2.811 mm^2/s at 40°C is within the criteria ≤ 20.5 mm^2/s at 40°C warranting a classification of liquid DCPD in Category 1 for aspiration hazard.

Conclusion on classification and labelling for aspiration hazard

Classification with Category 1 is proposed for DCPD
Symbol: Health hazard
Signal word: Danger
Hazard statement: H304: May be fatal if swallowed and enters airways.

9. EVALUATION OF ENVIRONMENTAL HAZARDS

9.1 HAZARDOUS TO THE AQUATIC ENVIRONMENT

9.1.1 Rapid degradability of organic substances

Table 41: Summary of relevant information on rapid degradability

Method, test guideline, and deviation(s) if any	**Results**	**Remarks**	**Reference**
OECD Guideline 301 C (Ready Biodegradability : Modified MITI Test (I)) GLP compliant	The results were 0% biodegradation in 2 weeks.	Test substance: DCPD 99% Oxygen conditions: aerobic Details on inoculums: water Duration of test (contact time): 2 wk	M.I.T.I. Test was performed in CITI, Japan; National Institute of Technology and Evaluation. 2002. Biodegradation and Bioaccumulation of the Existing Chemical Substances under the Chemical Substances Control Law. Data source: ECHA website, OECD SIDS, US EPA
Unknown	1.6% after 21 days Not readily biodegradable	Test substance: DCPD, purity unknown Inoculum or test system: from surface water, adapted Initial test substance concentration: 5 mg/L based on test mat.	Spangoord, R.J. et a. (1979): NTIS Report No. AD AO 78236,|SRI International (contract no. DAMD 17-78-C-8053) Data source: ECHA website, OECD SIDS
OECD Guideline 301 F with the exception of the inoculum preparation which was performed ASTM D5864 GLP compliant	% Degradation of test substance: 0% after 28 days Parameter: O_2 consumption No measurable biodegradation observed over a 28 day testing period. DCPD/Codimer Concentrate cannot be considered readily biodegradable.	Substance DCPD/ Codimer Concentrate, Naphtha CAS number: 68478-10-4 Inoculum or test system: other: Activated Slude supernatant Details on inoculum: activated sludge from the Clinton Sanitary Wastewater Treatment Plant, Annandale New Jersey Duration of test (contact time): 28d Parameter followed for biodegradation estimation: O_2 consumption	Author not specified. Report date 2004-04-18 Data source: ECHA website

QSAR: Biowin v4.1 in EPISuite 4 (2009)	The results of the BIOWIN 1, 2, 3, 5 and 6 predictions are that 3a,4,7,7a-tetrahydro-4,7-methanoindene is not readily biodegradable: Biowin 5 and 6 models contain the most molecular fragment predictors that are relevant to 3a,4,7,7a-tetrahydro-4,7-methanoindene (4 x alkenyl hydrogen, 2 x -CH2- [cyclic] and 4 x -CH - [cyclic]. The results of Biowin 1,2,3 and 4 are based on the molecular mass and equation constants for 3a,4,7,7a-tetrahydro-4,7-methanoindene. Biowin 1-2 predict a probability of between 0.75 and 0.76 for ready biodegradability. Biowin 3 predicts a probability of 2.91 (weeks-months) for ultimate biodegradability. Biowin 5 predicts a probability of 0.4328 for ready biodegradability. Biowin 6 predicts a probability of 0.2276 for ready biodegradability	The Biodegradation Probability Program (Biowin) estimates the probability for the rapid aerobic biodegradation of an organic chemical in the presence of mixed populations of environmental microorganisms. Estimates are based upon fragment constants that were developed using multiple linear and non-linear regression analyses.	Howard, P.H., Boethling, R.S., Stiteler, W.M., Meylan, W.M., Hueber, A.E., Beauman, J.A., and M.E. Larosche. Predictive model for aerobic biodegradability developed from a file of evaluated biodegradation data. 1992. Environ. Toxicol. Chem. 11: 593-603. Data source: ECHA website
QSAR: BioCHwin v1.01 in EPISuite 4 (2009).	% primary degradation of test substance: 50% in 21.4 days Remark: Predicted on the basis of the presence of an alkenyl hydeogen and cyclic hydrogen functional groups.	BioHCwin is a predictive model for determining quantitative primary biodegradation half-lives for individual petroleum hydrocarbons. A half-life in days is estimated using a multiple linear regression against counts of 31 distinct molecular fragments.	Howard, P.H., W.M., Meylan, Aronson, D., Stiteler,W.M., Tunkel, J., Comber, M. and Parkerton, F. A New Biodegradation Prediction Model Specific to Petroleum Hydrocarbons. 2005. Environ. Toxicol. Chem. 24(8): 1847-1860. Data source: ECHA website
Unknown	BOD5/ThOD =< 4 %		ECETOC Bericht No. 19, Dicyclopentadiene. Data source: ECHA website
QSAR: AOPWIN (v1.92a)	OVERALL OH Rate Constant = 119.1993 E-12 cm^3/molecule-sec HALF-LIFE = 0.090 Days (12-hr day; 1.5E6 OH/cm^3) HALF-LIFE = 1.077 Hrs OVERALL OZONE Rate Constant = 40.000000 E-17 cm^3/molecule-sec	The estimation methods used by AOPWIN are based upon the structure-activity relationship (SAR) methods developed by Dr. Roger Atkinson and co-workers. AOPWIN incorporates updated fragment and	Publication: Atkinson, R., Kinetics and mechanisms of the gas-phase reactions of the hydroxyl radical with organic compounds under atmospheric conditions, 1985, Chem. Rev. 85: 69-201

	HALF-LIFE = 0.029 Days (at 7E11 mol/cm^3) HALF-LIFE = 41.256 Min	reaction values as cited in Kwok and Atkinson (1995)	Data source: ECHA website
Unknown	Degradation in % (for indirect photolysis): > 50 after 0.1 day(s)	Sensitiser: O_3, OH	ECETOC Bericht No. 19, Dicyclopentadiene. Data source: ECHA website

Ready biodegradability

Two studies on biodegradation performed with DCPD are available.
The first one was conducted with 99% DCPD according to OECD Guideline 301 C (Ready Biodegradability: Modified MITI Test (I)), GLP compliant and indicates 0% biodegradation in 2 weeks. Despite the fact that original report is unavailable, the data are considered as appropriate for classification purposes as taken from the reliable source (OECD SIDS). Other available data on biodegradability of DCPD support these results even though limited information is available from this study.

The second study reported 1.6% after 21 days, but provides a low level of details (among them method and purity of test substance are unknown). Thus, this data can be used as a supportive information.

No measurable biodegradation was observed over a 28 day testing period in the GLP compliant read-across study with DCPD/Codimer concentrate consisted of DCPD (29%), methylcyclopentadiene dimer (13%), cyclopentadiene/methylcyclopentadiene codimer (13%), other codimers of cyclopentadiene - e.g. with 1,3-butadiene or isoprene (7%), other similar codimers of ethycyclopentadiene (22%), balance (16%). The study was conducted under OECD Guideline 301 F with the exception of the inoculum preparation which was performed ASTM D5864.

There are two QSAR estimations of DCPD degradation are available which in the presence of experimental data can be used as an additional information.

The Biowin (Biodegradation Probability Program) estimates the probability for the rapid aerobic biodegradation of an organic chemical in the presence of mixed populations of environmental microorganisms. Estimates are based upon fragment constants that were developed using multiple linear and non-linear regression analyses. The results of the BIOWIN 1, 2, 3, 5 and 6 predictions are that 3a,4,7,7a-tetrahydro-4,7-methanoindene is not readily biodegradable.

BioHCwin estimation predicts 50% primary degradation in 21.4 days on the basis of the presence of an alkenyl hydeogen and cyclic hydrogen functional groups.

BOD_5/COD

The only data with low level of study details is available: BOD_5/ThOD =< 4 %.

Other convincing scientific evidence

No data available.

Aquatic simulation tests

No data available.

Field investigations and monitoring data (if relevant for C&L)

No data available.

Inherent and Enhanced Ready Biodegradability tests

No data available.

Soil and sediment degradation data

No data available.

Hydrolysis

No data available.

Photochemical degradation

The overall OH rate constant was calculated to be 119.1993E-12 cm³ molecule-1 s-1 based upon the structure-activity relationship (SAR) methods developed by Dr. Roger Atkinson and co-workers. The half-life in air was calculated to be 1.08 hours for DCPD based on an OH concentration of 1.5 x 10^6 OH/cm3 and a 12 hour day, using AOPWIN (v1.92a) in EPI Suite (v4.0). Long range transport in air for DCPD is not expected.
ECETOC Bericht No. 19 provides data on > 50% after 0.1 day(s) for indirect photolysis.

9.1.2 Environmental transformation of metals or inorganic metal compounds

Table 42: Summary of relevant information on rapid environmental transformation

Method, test guideline, and deviation(s) if any	**Results**	**Key or Supportive study**	**Remarks**	**Reference**
No applicable.				

Summary of data/information on environmental transformation

No applicable.

9.1.3 Environmental fate and other relevant information

Not considered in this document.

9.1.4 Bioaccumulation

Table 43: Summary of relevant information on bioaccumulation

Method, test guideline, and deviation(s) if any	Species	Results	Remarks	Reference
equivalent or similar to OECD Guideline 305 Deviations: yes slightly lower test temperature, design non-GLP	*Lepomis macrochirus*	A BCF of 53 was reported in Bluegill for DCPD.	Test substance: DCPD, purity unknown	Author not specified. Review article or handbook dated 1976. Data source: ECHA website – Exp Key Bioaccumulation: aquatic/sediment.001
OECD Guideline 305 C GLP compliant	*Cyprinus carpio*	BCF reported: Concentration (1) 0.3 mg/l BCF (1) 112 -330; concentration (2) 0.03 mg/l BCF (2) 58.9 -384	Test substance: DCPD 99%	MITI, Japan (1997) Data source: ECHA website, OECD SIDS
Unknown	*Lepomis macrochirus*	BCF = 53 at concentration 1 mg/l over 96h	Test substance: DCPD, purity unknown	ECETOC Bericht No. 19, Dicyclopentadiene Data source: ECHA website– NS Disregarded Bioaccumulation: aquatic/sediment.005

Estimated bioaccumulation

Not available.

Measured partition coefficient and bioaccumulation test data

In the most reliable study a BCF of 53 was reported in Bluegill for DCPD. Bluegill exposed to 1.0 mg/l 14C-DCPD during bioconcentration study appeared normal, fed readily and generally showed no signs of stress due to chemical toxicity. Mean measured concentration of 14 C-DCPD in the water through 14 days of exposure was 0.98 ± 0.25 mg/l. Estimated BCF for bluegill exposed to 14C-DCPD is 53. Report states "it appears that the potential of DCPD to bioconcentrate is slight".

Other reliable study (OECD Guideline 305 C, GLP compliant, however with low level of details and unavailable primary source) provides BCF of range 58.9 -384 at concentration 0.03 mg/l and of range 112 - 330 at 0.3 mg/l DCPD.

9.1.5 Acute aquatic hazard

Table 44: Summary of relevant information on acute aquatic toxicity

Method, test guideline, and deviation(s) if any	Species	Test material	Results[1]	Remarks	Reference
Fish					
equivalent or similar to Macroinvertebrate and fish toxicity tests followed the recommended bioassay procedures as described in the "Methods for Acute Toxicity Tests with Fish, Macro invertebrates, and Amphibians" (US EPA 1975) Non-GLP	*Ictalurus punctatus*	DCPD	The 96 hr LC_{50} was 15.7 mg/l based on nominal concentrations	Stock solution for fish ration of 1.5 parts DCPD :98.5 parts acetone (volume:volume)	Author not specified. Publication, 1976 Data source: ECHA website – Exp WoE Short-term toxicity to fish.005
equivalent or similar to Macroinvertebrate and fish toxicity tests followed the recommended bioassay procedures as described in the "Methods for Acute Toxicity Tests with Fish, Macro invertebrates, and Amphibians" (US EPA 1975) Non-GLP	*Lepomis macrochirus*	DCPD	The 96 hr LC_{50} was 23.3 mg/l based on nominal concentrations	Stock solution for fish ration of 1.5 parts DCPD :98.5 parts acetone (volume:volume)	Author not specified. Publication, 1976 Data source: ECHA website – Exp WoE Short-term toxicity to fish.008
equivalent or similar to Macroinvertebrate and fish toxicity tests followed the recommended bioassay procedures as described in the "Methods for Acute Toxicity	*Salmo gairdneri (*new name: *Oncorhynchus mykiss)*	DCPD	The 96 hr LC_{50} was 15.9 mg/l based on nominal concentrations	Stock solution for fish ration of 1.5 parts DCPD: 98.5 parts acetone (volume:volume)	Author not specified. Publication, 1976 Data source: ECHA website – Exp WoE Short-term toxicity to fish.010

Tests with Fish, Macro invertebrates, and Amphibians" (US EPA 1975) Non-GLP					
equivalent or similar to Macroinvertebra-te and fish toxicity tests followed the recommended bioassay procedures as described in the "Methods for Acute Toxicity Tests with Fish, Macro invertebrates, and Amphibians" (US EPA 1975) Non-GLP	*Pimephales promelas*	DCPD	The 96 hr LC_{50} was 31.1 mg/l based on nominal concentrations	Stock solution for fish ration of 1.5 parts DCPD :98.5 parts acetone (volume:volume)	Author not specified. Publication, 1976 Data source: ECHA website – Exp WoE Short-term toxicity to fish.007
OECD Guideline 203 (Fish, Acute Toxicity Test) Non-GLP	*Oryzias latipes (Himedaka)*	DCPD, 94,9%	The 96 hr LC_{50} was 4.3 mg/l based on nominal concentrations The 24 hr LC_{50} was 11 mg/l based on nominal concentrations The 48 hr LC_{50} was 6.7 mg/l based on nominal concentrations The 72 hr LC_{50} was 6.7 mg/l based on nominal concentrations	This study is unavailable for review, but it has been used in the OECD SIDS	Environment Agency of JAPAN (1995) Data source: ECHA website – Exp WoE Short-term toxicity to fish.006 and OECD SIDS
Method: Unknown Non-GLP	*Salmo gairdneri (*new name: *Oncorhynch us mykiss)*	DCPD, purity unkno wn	The 96 hr LC_{50} was 16 mg/l		ECETOC Bericht No. 19, Dicyclopentadiene. Data source: ECHA website – NS Disregarded Short-term toxicity to fish.003
Method: Unknown Non-GLP	*Ictalurus punctatus*	DCPD, purity unkno wn	The 96 hr LC_{50} was 16 mg/l		ECETOC Bericht No. 19, Dicyclopentadiene. Data source: ECHA website – NS Disregarded

					Short-term toxicity to fish.002, OECD SIDS
Method: Unknown Non-GLP	*Oryzias latipes*	DCPD, purity unknown	The 48 hr LC_{50} was 25 mg/l	Not relevant for classification purposes	Spangoord, R.J. et a. (1979): NTIS Report No. AD AO 78236,|SRI International (contract no. DAMD 17-78-C-8053). Data source: ECHA website – NS Disregarded Short-term toxicity to fish.009
Method: Unknown Non-GLP	*Lepomis macrochirus*	DCPD, purity unknown	The 96 hr LC_{50} was 23 mg/l		ECETOC Bericht No. 19, Dicyclopentadiene Data source: ECHA website – NS Disregarded Short-term toxicity to fish.004
QSAR Ecosar v1.00	*fish*	DCPD	The estimated 96 hr LC_{50} for fish is 9.765 mg/L		Ecosar v1.00. Nabholz V and Mayo-Bean K. 2009 US Environmental Protection Agency Data source: ECHA website – QSAR WoE Short-term toxicity to fish.001
Invertebrates					
OECD Guideline 202 GLP compliant	*Daphnia magna*	DCPD 92%	The 48h EC_{50} calculated to be 0.62 mg/l with 95% confidence limits of 0.52-0.72 mg/l based on nominal concentrations The 48h NOEC was 0.22 mg/l based on nominal concentrations		Author not specified. Report date 1995-06-18 Data source: ECHA website – Exp Key Short-term toxicity to aquatic invertebrates.002

ASTM (1980) E728-80 Non-GLP	*Daphnia pulex*	DCPD, 94-99%	The 48h EC_{50} was 4.2 mg/L based on nominal concentrations		Publication: Passino-Reader DR, Hickey JP, Ogilvie LM/ Toxicity to Daphnia pulex and QSAR Predictions for Polycyclic Hydrocarbons Representatvie of Great Lakes Contaminants, Bull. Environ. Contam. Toxicol (1997) 59:834-840 Data source: ECHA website – Exp Supporting Short-term toxicity to aquatic invertebrates.001
OECD Guideline 202 Non-GLP	*Daphnia magna*	DCPD, 94.9%	The 48 hour EC_{50} was 8 mg/l based on nominal concentrations The 24 hour EC_{50} was 8.6 mg/l based on nominal concentrations The 48 hour NOEC was <1.8 mg/l based on nominal concentrations	This study is unavailable for review, but it has been used in the OECD SIDS	Environment Agency of JAPAN (1997) Data source: ECHA website – Exp Supporting Short-term toxicity to aquatic invertebrates.006 and OECD SIDS
Method: Unknown Non-GLP	*Daphnia magna*	DCPD	The 48 hour EC_{50} was 11 mg/l		ECETOC Bericht No. 19, Dicyclopentadiene Data source: ECHA website – NS Disregarded Short-term toxicity to aquatic invertebrates.007

Unknown	*Unknown*	DCPD	The 3 hour LC_{50} was 40 mg/l	Not relevant for classification purposes	Yoshioka, Y. et al. (1986): Ecotoxicol. Environ. Safety 12,|15- 21 Data source: ECHA website – NS Disregarded Short-term toxicity to aquatic invertebrates.004
QSAR Ecosar v1.00	*Daphnia magna*	DCPD	The estimated 48 hr LC_{50} is 6.444 mg/l		Computer programme US Environmental Protection Agency, Nabholz V and Mayo-Bean K, Ecosar v1.00, 2009 Data source: ECHA website – QSAR Supporting Short-term toxicity to aquatic invertebrates.005
Algae and aquatic plants					
equivalent or similar to Phytoplankton assay procedures followed the Algal Assay Procedure: Bottle Test (US EA 1971) Non-GLP	*Anabaena flos-aquae*	DCPD	The 96 hour EC_{50} was 22 mg/l	The stock solutions prepared in the ratio of 1 part DCPD:99 parts acetone (volume:volume)	Author not specified. Publication, 1976 Data source: ECHA website – Exp WoE Toxicity to aquatic algae and cyanobacteria.003
equivalent or similar to Phytoplankton assay procedures followed the Algal Assay Procedure: Bottle Test (US EA 1971) Non-GLP	*Microcystis aeruginosa*	DCPD	The 96 hour EC_{50} was 31 mg/l	The stock solutions prepared in the ratio of 1 part DCPD:99 parts acetone (volume:volume)	Author not specified. Publication, 1976 Data source: ECHA website – Exp WoE Toxicity to aquatic algae and cyanobacteria.006
equivalent or similar to Phytoplankton assay procedures followed the Algal Assay Procedure: Bottle Test (US EA 1971) Non-GLP	*Selenastrum capricornutum (*new name: *Pseudokirchnerella subcapitata)*	DCPD	The 96 hour EC_{50} was >100 mg/l	The stock solutions prepared in the ratio of 1 part DCPD:99 parts acetone (volume:volume)	Author not specified. Publication, 1976 Data source: ECHA website – Exp WoE Toxicity to aquatic algae and cyanobacteria.002
OECD Guideline 201	*Selenastrum capricornutu*	DCPD, 94,9%	The 72 hour EC_{50} (growth rate) was	This study is unavailable for	Environment Agency of JAPAN (1995)

Non-GLP	*m (*new name: *Pseudokirchnerella subcapitata)*		27mg/l and a NOEC of 18 mg/l was reported	review, but it has been used in the OECD SIDS	Data source: ECHA website – Exp WoE Toxicity to aquatic algae and cyanobacteria.004, OECD SIDS
Method: Unknown Non-GLP	*Anabaena flos-aquae*		The 96 hour LC_{50} was 22 mg/l		ECETOC Bericht No. 19, Dicyclopentadiene ECHA website – NS Disregarded Toxicity to aquatic algae and cyanobacteria.005
Method: Unknown Non-GLP	*Selenastrum capricornutum (*new name: *Pseudokirchnerella subcapitata)*	DCPD	The 96 hour EC_{50} was >100 mg/l		ECETOC Bericht No. 19, Dicyclopentadiene ECHA website – NS Disregarded Toxicity to aquatic algae and cyanobacteria.001
QSAR: Ecosar v1.00	*Green Algae*	DCPD	Estimated 96 hour EC_{50} for Green Algae is 7.175 mg/L and the ChV is 2.387 mg/L, which corresponds to a NOEC of 1.688 mg/L.		US Environmental Protection Agency, computer programme, Nabholz V and Mayo-Bean K, Ecosar v1.00, 2009 Data source: ECHA website – QSAR WoE Toxicity to aquatic algae and cyanobacteria.007

[1] Indicate if the results are based on the measured or on the nominal concentration.

Acute (short-term) toxicity to fish

Nine studies are available on acute toxicity of DCPD to fish. Four of them were equivalent or similar to Macroinvertebrate and fish toxicity tests followed the recommended bioassay procedures as described in the "Methods for Acute Toxicity Tests with Fish, Macro invertebrates, and Amphibians" (US EPA 1975) performed with different species. The values of 96h LC_{50} of all these studies is in the range between 15.7-31.1 mg/l.

One study in *Oryzias latipes (Himedaka)* conducted under OECD Guideline 203 with 94.9% DCPD is available. The 96 hour LC_{50} was 4.3 mg/l with confidence level of 3.1 mg/l to 5.8 mg/l. According to item 4.1.1.3 of the GHS, for determination of acute aquatic toxicity a fish 96 hour LC_{50} (OECD Test Guideline 203 or equivalent) is normally used. Thus, the 24, 48 and 72 hour LC_{50} values obtained from this study are not relevant for classification purposes and were disregarded. In spite of the fact that the study has low level of details it was taken from the reliable source (OECD SIDS) and is considered as reliable for the purpose of these exercise.

Three studies reported 96 hour LC_{50} in range 16-23 mg/l with reference to ECETOC Bericht No. 19 are available. All these studies have very low level of details and performed under unknown method. Thus, they are cannot be used as a basis for classification purpose.

The study provided the 48 hr LC_{50} in *Oryzias latipes* is not relevant for classification purposes and, thus, was disregarded.

The 96 hr LC_{50} for fish was estimated at 9.765 mg/L using QSAR calculation. The use of ECOSAR to predict the acute aquatic toxicity is an appropriate technique to use as DCPD is in the chemical class of neutral organics.

Acute (short-term) toxicity to aquatic invertebrates

There are six studies available on acute (short-term) toxicity to aquatic invertebrates. In the most reliable study performed according to OECD Guideline 202 and GLP complient, the 48h EC_{50} of 92% DCPD in *Daphnia magna* calculated to be 0.62 mg/l with 95% confidence limits of 0.52-0.72 mg/l based on nominal concentrations. As the volatilisation of the substance is not expected to be critical, based on the low vapour pressure, the reporting of the results as nominal concentrations was considered to be adequate. The test material was prepared as a solvent stock solution: 400 mg of test material dissolved in 10ml dimethylformamide containing 1% (v/v) Tween 80. 200 ul of this stock solution dispersed in reconstituted water and volume adjusted to 2 litres to give test concentration of 4.0 mg/l. There is no any evidence that solvent could leads to a higher toxicity compared to pure DCPD or may alter the uptake of test material by aquatic invertebrates.

Other two reliable studies provide the 48h EC_{50} = 4.2 mg/L for *Daphnia pulex* and EC_{50}= 8 mg/l for *Daphnia magna*. The estimated (QSARs in the ECOSAR program) value of 48 hr LC_{50} was 6.444 mg/l for *Daphnia magna*. The use of ECOSAR to predict the acute aquatic toxicity is an appropriate technique to use as DCPD is in the chemical class of neutral organics.

Acute (short-term) toxicity to algae or aquatic plants

Seven studies are available on acute (short-term) toxicity of DCPD to algae or aquatic plants. In the most reliable study equivalent or similar to Phytoplankton assay procedures followed the Algal Assay Procedure: Bottle Test (US EA 1971) the 96 hour EC_{50} was 22 mg/l in *Anabaena flos-aquae*.

Other available studies provide 96 hour or 72 hour EC_{50} in the range >22 mg/l and can be considered as supportive for classification purposes.

The only one study performed data lower than 10 mg/L: estimated (QSARs in the Ecosar program) 96 hr EC_{50} for *Green Algae* is 7.175 mg/l. The use of ECOSAR to predict the acute aquatic toxicity is an appropriate technique to use as DCPD is in the chemical class of neutral organics. However, as far as the experimental data are available, QSAR calculation cannot be used as a basis for classification purposes.

Acute (short-term) toxicity to other aquatic organisms

No data available.

9.1.6 Long-term aquatic hazard

Table 45: Summary of relevant information on chronic aquatic toxicity

Method, test guideline, and deviation(s) if any	Species	Test material	Results	Remarks	Reference
Fish					
equivalent or similar to OECD Guideline 204 Deviations: yes Length of fish, temperature, water hardness, design Non GLP	*Lepomis macrochirus*	DCPD	No effect concentration of 0.98±0.25 mg/l was reported in the study over 14 days. As this was the highest tested concentration, in the bioaccumulation study it was not able to determine whether this is an actual NOEC.		Author not specified. Review article or handbook dated 1976 Data source: ECHA website – Exp WoE Long-term toxicity to fish.002
QSAR ECOWIN v1 ECOSAR Classes	*Fish*		The estimated 30d ChV value of 1.084 mg/L corresponds to 30d long-term fish NOEC of 0.767 mg/L.	Based on a log Kow: 3.165	ECOWIN v1 ECOSAR Classes for Microsoft Windows. Nabholz V and Mayo-Bean K. 2009 Data source: ECHA website – QSAR WoE Long-term toxicity to fish.001
Invertebrates					
OECD TG 202 (1984) Non GLP	*Daphnia magna*	DCPD 94.9%	Chronic toxicity to *daphnia magna* from DCPD over 21 days showed EC_{50} 4.0 mg/l, NOEC 3.2 mg/l and LOEC 10 mg/l using OECD TG 202 (1984)	This study is unavailable for review, but it has been used in the OECD SIDS	Environment Agency of JAPAN (1997) Data source: ECHA website – Exp Disregarded Long-term toxicity to aquatic invertebrates.003 and OECD SIDS
QSAR ECOWIN v1 ECOSAR	*Daphnia sp.*		The estimated 21d ChV for *Daphnia* is 0.812 mg/L, which corresponds to a 21d NOEC of 0.574 mg/L.	Based on a log Kow of 3.165	ECOWIN v1 ECOSAR Classes for Microsoft Windows. Nabholz V and Mayo-Bean K. 2009 Data source: ECHA website – QSAR WoE Long-term toxicity to aquatic invertebrates.001

Algae and aquatic plants					
OECD Guideline 201 Non-GLP	*Selenastrum capricornutum (*new name: *Pseudokirchnerella subcapitata)*	DCPD	NOEC of 18 mg/l was reported		Environment Agency of JAPAN (1995) Data source: ECHA website – Exp WoE Toxicity to aquatic algae and cyanobacteria.004 and OECD SIDS

[1] Indicate if the results are based on the measured or on the nominal concentration.

Chronic toxicity to fish

The only one experimental study (equivalent or similar to OECD Guideline 204, non GLP) relevant for chronic toxicity to fish is available for DCPD. No effect concentration of 0.98±0.25 mg/l over 14 days with 7 day depuration period was reported. As this was the highest tested concentration in the bioaccumulation study it was not able to determine whether this is an actual NOEC, and therefore this value cannot be considered relevant for classification purposes.

The 30d ChV value of 1.084 mg/L for fish was estimated using QSAR calculation. This value is corresponds to 30d long-term fish NOEC of 0.767 mg/L. The use of ECOSAR to predict the chronic aquatic toxicity is an appropriate technique as DCPD is in the chemical class of neutral organics and thus, the obtained data can be considered as supportive.

Chronic toxicity to aquatic invertebrates

One study performed according to OECD Guideline 202 with *Daphnia magna* is available. In this study chronic toxicity from DCPD over 21 days showed EC_{50} 4.0 mg/l, NOEC 3.2 mg/l and LOEC 10 mg/l.

ECOSAR estimates 21d ChV for *Daphnia sp.* of 0.812 mg/L, which corresponds to a 21d NOEC of 0.574 mg/L. The use of ECOSAR to predict the chronic aquatic toxicity is an appropriate technique as DCPD is in the chemical class of neutral organics. However, the experimental data for this trophic level are available and preferred for classification purposes.

Chronic toxicity to algae or aquatic plants

NOEC value of 18 mg/l is available for one study followed OECD Guideline 201 with *Selenastrum capricornutum (*new name: *Pseudokirchnerella subcapitata).*

Chronic toxicity to other aquatic organisms

No data available.

Comparison with the GHS criteria for hazardous to the aquatic environment

Acute aquatic hazard

There are several acute toxicity studies available for all three trophic levels. The following data are considered reliable and relevant for classification:

Fish: 96-hour LC_{50} = 4.3 mg/L (nominal concentration, *Oryzias latipes*)
Aquatic invertebrates: 48-hour EC_{50} = 0.62 mg/L (nominal concentration, *Daphnia magna*)
Algae: 96-hour EC_{50} = 22.0 mg/L (nominal concentration, *Anabaena flosaquae*).

The most sensitive species for acute toxicity of DCPD was aquatic invertebrates, providing the lowest EC_{50} of 0.62 mg/L in *Daphnia magna*. This value is below the classification threshold value of 1 mg/L for Category Acute 1 and warrant value of the M factor of 1 ($0.1 < EC_{50}=0.62$ mg/L ≤ 1).

Long-term aquatic hazard (including bioaccumulation and degradation)

Biodegradation
Based on the available data on ready biodegradability: 0% biodegradation in 2 weeks in OECD Guideline 301 C, GLP compliant test; no measurable biodegradation over a 28 day in the OECD Guideline 301 F, GLP compliant read-across study with DCPD/Codimer concentrate) it can be concluded that DCPD is non-rapidly degradable substances (according to the GHS, substances are considered rapidly degradable in the environment if 60% of theoretical maxima under tests based on oxygen depletion or carbon dioxide generation is reached).

Bioaccumulation
Two available studies provide BCF of range 53-384 in fish. Based on available data and in comparison with the GHS criteria (according to 4.1.2.10 a BCF in fish of < 500 is considered as indicative of a low level of bioconcentration) it can be concluded that the DCPD has low potential for bioaccumulation.

Chronic aquatic toxicity
Experimental data on chronic aquatic toxicity of DCPD for two following trophic levels are available: aquatic invertebrates and algae/aquatic plants, the most sensitive being invertebrates. As the DCPD is non-rapidly degradable substances Table 4.1.1 (b) (i) of GHS should be used.
The 21days NOEC = 3.2 mg/l in Daphnia magna is out of the range for Category Chronic 2 ($0.1 < NOEC \leq 1$ mg/l) and warrants no classification of DCPD for chronic aquatic toxicity.

There are no chronic data available for fish and, thus, the surrogate approach should be considered. Based on the acute toxicity in *Oryzias latipes (himedaka)* value the 96 hour $LC_{50}=4.3$ mg/l and non-rapid degradation, the classification based on Table 4.1.1 (b) (iii) applies and the substance should be classified in Category Chronic 2 (96 hr LC_{50} (for fish) > 1 but ≤ 10 mg/l and the substance is not rapidly degradable). The QSAR (ECOSAR) estimation available for this trophic level: 30d ChV value of 1.084 mg/L which corresponds to 30d long-term fish NOEC of 0.767 mg/L (based on a log Kow 3.165). This value is also support the classification of DCPD as Category 2 of chronic aquatic toxicity.

Thus, based on the most stringent outcome (the surrogate approach), the DCPD is proposed to classify as Category 2 for long term (chronic) aquatic hazard according to the GHS.

Conclusion on classification and labelling for hazardous to the aquatic environment

Classification with Category 1 for short-term (acute) aquatic hazard.
Symbol: Environment
Signal word: Warning
Hazard statement: H400: Very toxic to aquatic life.

Classification with Category 2 for long-term (chronic) aquatic hazard.
Symbol: Environment
Signal word: No signal word
Hazard statement: H411: Toxic to aquatic life with long lasting effects.

9.2 HAZARDOUS TO THE OZONE LAYER

Conclusion on classification and labelling for hazardous to the ozone layer

DCPD is not included in *The Montreal Protocol on Substances that Deplete the Ozone Layer* and therefore it is not proposed to be classified in this hazard class.

REFERENCES

Achiev. Ind. Hyg. Occp. Med., 10, 61 (1954)

American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2005., p. 1.

Atkinson, R., Kinetics and mechanisms of the gas-phase reactions of the hydroxyl radical with organic compounds under atmospheric conditions, 1985, Chem. Rev. 85: 69-201

Author not specified. Information sheet (1998) & Report date 1993-12-31. Data source: ECHA web-site

Author not specified. Publication (1962). Data source: ECHA web-site

Author not specified. Publication (1971). Data source: ECHA web-site

Author not specified. Publication (1976). Data source: ECHA web-site

Author not specified. Publication (1997). Data source: ECHA web-site

Author not specified. Report (1980). Data source: ECHA web-site

Author not specified. Report date 1976-06-24. Data source: ECHA web-site

Author not specified. Report date 1981-04-29. Data source: ECHA web-site

Author not specified. Report date 1989-01-17. Data source: ECHA web-site

Author not specified. Report date 1993-02-04. Data source: ECHA web-site

Author not specified. Report date 1993-08-11. Data source: ECHA web-site

Author not specified. Report date 1995-06-18. Data source: ECHA web-site

Author not specified. Report date 2000-03-08. Data source: ECHA web-site

Author not specified. Report date 2004-04-18. Data source: ECHA web-site

Author not specified. Report date 2004-07-25. Data source: ECHA web-site

Author not specified. Review article or handbook dated 1976

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:38; p. 2:39; p. 4:203

Biodegradation and Bioaccumulation of the Existing Chemical Substances under the Chemical Substances Control Law.

Brit.J. Industr. Med., 27,1 (1970);

CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.

Computer programme US Environmental Protection Agency, Nabholz V and Mayo-Bean K, Ecosar v1.00, 2009

CRC Press, Boca Raton, Handbook of Chemistry and Physics, 2008

ECETOC Bericht No. 19, Dicyclopentadiene. Data source: ECHA website

Environment Agency of JAPAN (1995)

Estimation Program Interface (EPI) Suite. Ver.3.12. Nov 30, 2004

Estimation Programs Interface Suite™ for Microsoft® Windows, v4.00. U.S. Environmental Protection Agency, Washington, DC, USA.

Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987., p. A716/Aug 87

International Chemical Safety Card on Dicyclopentadiene. (October 2005). Available from, as of October 03, 2006

Ivie GW and Oehler DD: Fate of dicyclopentadiene in a lactating cow. Bull. Environm. Contam. Toxicol. 24, 662-670 (1980 year)

Japan Chemical Industry Ecology-Toxicology And Information Center, Japan; mutagenicity test data of existing chemical substances based on the toxicity investigation of the Industrial Safety And Health Law; 1996

Kagaku daijiten (Chemical dictionary)

Kinkead, E.R. et al. (1971): Toxicol. Appl. Pharmacol. 20, 552- 561.

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 1228

Lide, D.R. CRC Handbook of Chemistry and Physics 86TH Edition 2005-2006. CRC Press, Taylor & Francis, Boca Raton, FL 2005, p. 3-162

MITI, Japan (1997) Test was performed by CITI, Japan.

M.I.T.I. Test was performed in CITI, Japan; National Institute of Technology and Evaluation. 2002.

NIOSH. NIOSH Pocket Guide to Chemical Hazards & Other Databases CD-ROM. Department of Health & Human Services, Centers for Disease Prevention & Control. National Institute for Occupational Safety & Health. DHHS (NIOSH) (2005)

Passino-Reader DR, Hickey JP, Ogilvie LM/ Toxicity to Daphnia pulex and QSAR Predictions for Polycyclic Hydrocarbons Representatvie of Great Lakes Contaminants, Bull. Environ. Contam. Toxicol (1997) 59:834-840

Rosenblatt et al. (1975): NTIS Rep. No. AD-AO 30 428, J1-8.

Smyth HF, Carpenter CP, Weil CS and Pozzani UC, "Range-Finding Toxicity Data List V" Arch Ind Hyg Occup. 1954 Vol 10 pp 61-68

Smyth et al., 1962

Spangoord, R.J. et a. (1979): NTIS Report No. AD AO 78236,|SRI International (contract no. DAMD 17-78-C-8053)

Syracuse, NY: Syracuse Research Corporation.

The Sigma-Aldrich Library of Reguratory and Safety Data

Toxicol. Appl. Pharmacol., 20, 552, (1971);

TSCATS OTS0558246; Data source: US EPA Screening-level hazard characterization Document

RTECS Database (Prehled Prumyslove Toxikologie 50 (1986)

Ullmann's Encyclopedia of Industrial Chemistry. Fifth, Completely Revised Edition, Vol. A8 (1987), S. 227-228.

U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.

USEPA Genetox Program (1988) Data source: OECD SIDS

USEPA; Health and Environmental Effects Profile for Cyclopentadiene and Dicyclopentadiene p.16 (1987) ECAO-CIN-G012

WAYNE G, OEHLER DD; BULL ENVIRON CONTAM TOXICOL 24 (5): 662-70 (1980)

Yoshioka, Y. et al. (1986): Ecotoxicol. Environ. Safety 12,|15- 21

Zeiger E et al; Environ Mutagen 9: 1-110 (1987)

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ENVIRONMENT DIRECTORATE
JOINT MEETING OF THE CHEMICALS COMMITTEE AND THE WORKING PARTY ON CHEMICALS, PESTICIDES AND BIOTECHNOLOGY

ANNEX 1 TO THE REPORT ON THE PROPOSAL FOR CLASSIFICATION AND LABELLING (C&L) OF DICYCLOPENTADIENE

Series on Testing & Assessment
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No. 248

ANNEX 1 TO:

REPORT ON THE PROPOSAL FOR CLASSIFICATION AND LABELLING (C&L) OF DICYCLOPENTADIENE

Joint Pilot Project of the OECD and the UN Sub-Committee of Experts on the Globally Harmonised System of Classification and Labelling of Chemicals

IOMC
INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS
A cooperative agreement among FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD

Environment Directorate
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
Paris, 2016

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FOREWORD

This document is Annex 1 to the Report on the Proposal for Classification and Labelling (C&L) of Dicyclopentadiene.

This document is published under the responsibility of the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology of the OECD.

Contents

AIM OF ANNEX I TO THE C&L REPORT

The aim of the Annex I is to provide detailed study summaries, transparently and objectively as in the original data source, without subjective interpretations. For the collection of substance's data the following publically available data sources were used:

- ECHA's web-site: Search for Chemicals: CAS 77-73-6 http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/1
- US EPA Screening-level hazard characterization Document, December 2010. Available online at http://www.epa.gov/chemrtk/hpvis/hazchar/Category_Resin%20Oils_December_2010.pdf
- OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6). Available online at http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf as of September 28, 2010.
- Hazardous Substances Data Bank (HSDB) of TOXNET Databases.
- Chemical Carcinogenesis Research Information System (CCRIS) of TOXNET Databases.

1. PHYSICAL HAZARDS

1.1 Explosives

Study scientifically unjustified: there are no chemical groups associated with explosive properties present in the molecule.

1.2 Flammable gases

Study is not applicable: DCPD is a solid at 20°C and 101,3 kPa.

1.3 Aerosols

Study scientifically unjustified: DCPD is not aerosol products.

1.4 Oxidising gases

Study is not applicable: DCPD is a solid at 20°C and 101,3 kPa.

1.5 Gases under pressure

Study is not applicable: DCPD is a solid at 20°C and 101,3 kPa.

1.6 Flammable liquids

Study 1:

Data source: ECHA website - Exp Key Flash point.002

Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/4/12/?documentUUID=cd94e5af-efc8-420e-845e-d10501138bec

Study reference:

NIOSH. Pocket Guide to Chemical Hazards (2005). National Institute for Occupational Safety & Health.

Detailed study summary and results:

The flashpoint of this substance is 32.2°C

Material and methods:

Type of method: not reported
GLP compliance: no data

Results:

Flash point: 32.2°C at 1013.5 hPa.
Pressure is assumed.

Reliability: 2 (reliable with restrictions). No information on the primary source of this data or the methods used is available. However, this information is considered to be suitable for use as a key study because it is taken from a reliable government source: The NIOSH Pocket Guide to Chemical Hazards is intended as a source of general industrial hygiene information for workers, employers, and occupational health professionals. The Pocket Guide presents key information and data from the US Department of Health and Human Services and as such is a reliable governmental source of information.

Study 2:

Data source: ECHA website - Exp Supporting Flash point.004
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/4/12/?documentUUID=ef6621ce-6a34-40f7-8d3f-16f0af29ed34

Study reference:

Publication of WHO International Programme on Chemical Safety, 2005. Chemical Safety Card: Dicyclopentadiene ICSC-0873

Detailed study summary and results:

Flash point: 32°C.

Material and methods:

Type of method: not reported
GLP compliance: no data

Results:

Flash point: 32°C.

Reliability: 2 (reliable with restrictions). No information on the primary source of this data or the methods used is available. However, this information is suitable for use as the supporting study for this endpoint because it is taken from a reliable peer reviewed database: The International Chemical Safety Cards (ICSC) are produced by the WHOs International Programme on Chemical Safety (IPCS). The introduction to the ICSC states that they report "information collected, verified and peer reviewed by internationally recognized scientists". Therefore, the values presented are acceptable as they are from a reliable secondary source of phys chem. data.

Study 3:

Data source: HSDB: DICYCLOPENTADIENE – Chemical Safety & Handling - Flash point
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Fire Protection Guide to Hazardous Materials. 13 ed. Quincy, MA: National Fire Protection Association, 2002., p. 325-41

Detailed study summary and results:

No information on the primary source of this data or the methods used is available. Flash point: 32 °C (90 deg F).

Material and methods:

Type of method: open cup
GLP compliance: no data

Results:

Flash point: 32 °C (90 deg F).

Study 4:

Data source: ECHA website – NS Disregarded Flash point.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/4/12/?documentUUID=be5b71b4-337c-49a7-8669-96e147202585

Study reference:

Sax, N.I. (1979): Dangerous Properties of Industrial|Materials, Fifth Edition, Van Nostrand Reinhold Comp. Inc., New York, S. 569.

Detailed study summary and results:

No information on the primary source of this data or the methods used is available.

Material and methods:

Type of method: not reported
GLP compliance: no data

Results:

Flash point: 32.2°C.

Study 5:

Data source: ECHA website – NS Disregarded Flash point.005
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/4/12/?documentUUID=f43c25a9-ac3f-432d-832f-0cb0bd2c7f0e

Study reference:

Ullmann''s Encyclopedia of Industrial Chemistry. Fifth, Completely Revised Edition, Vol. A8 (1987), S. 227-228.

Detailed study summary and results:

No information on the primary source of this data or the methods used is available.

Material and methods:

Type of method: not reported
GLP compliance: no data

Results:

Flash point: 41°C.

Study 6:

Data source: ECHA website – Exp Supporting Flash point.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/4/12/?documentUUID=ebd496b4-5f7e-4d55-a7a8-90636bd44850

Study reference:

Company data (2016).

Detailed study summary and results:

No information on guideline used and CLP compliance, data taken from company pro-forma.

Material and methods:

Type of method: not reported
GLP compliance: no data
Details on test material: Commercial DCPD (>80% purity)

Results:

Flash point 1: > 23 °C at 1 013 hPa (Standard pressure assumed)
Flash point 2: 25 - 32 °C at 1 013 hPa (Typical flash point values. Standard pressure assumed)

1.7 Flammable solids

No data available.

1.8 Self-reactive substances

Study scientifically unjustified: there are no chemical groups associated with explosive properties present in the molecule.

1.9 Pyrophoric liquids

Study is not applicable: DCPD is a solid at 20°C and 101,3 kPa.

Regarding liquid DCPD (commercial grades with purity <97%) study scientifically unjustified: liquid DCPD is stable at room temperature for prolonged periods of time.

1.10 Pyrophoric solids

Study scientifically unjustified: DCPD is a stable solid at room temperature for prolonged periods of time.

1.11 Self-heating substances

Study is not applicable: DCPD is a liquid at 140°C, therefore it is not possible to perform the test.

1.12 Substances which in contact with water emit flammable gases

Study scientifically unjustified: DCPD does not contain metals or metalloids.

1.13 Oxidising liquids

Study scientifically unjustified: DCPD does not contain oxygen, fluorine or chlorine.

1.14 Oxidising solids

Study scientifically unjustified: DCPD does not contain oxygen, fluorine or chlorine.

1.15 Organic peroxides

Study scientifically unjustified: DCPD does not contain the bivalent -O-O- structure.

1.16 Corrosive to metals

Study 1:

Data source: HSDB: DICYCLOPENTADIENE - Corrosivity
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987., p. A716/Aug 87

Detailed study summary and results:

Result: non-corrosive.
No information on the primary source of this data or the method used is available. However, this information is suitable for use for this endpoint because it is taken from a reliable peer reviewed database.

1.17 Desensitized explosives

Study scientifically unjustified: there are no chemical groups associated with explosive properties present in the molecule.

2. TOXICOKINETICS

Study 1

Data source: ECHA website - Exp Key Basic toxicokinetics.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/2/2/?documentUUID=d4fb014f-82ca-4fbc-8356-47c7f0d3304e

Study reference:

Author not specified. Report date 1976-06-24.

Detailed study summary and results:

Type of method: in vivo
Objective of study: absorption, distribution, metabolism, excretion.
Test guideline: No guideline available
Principles of method: Rates of absorption, tissue distribution, metabolism and rate of excretion of 14C labelled dicyclopentadiene
GLP compliance: no data

Test material identity: 3a,4,7,7a-tetrahydro-4,7-methanoindene, CAS 77-73-6
Radiolabelling: yes 14C

Name of test material (as cited in study report): Dicyclopentadiene (DCPD -14C)
Physical state: uniformly labelled with 14C
Analytical purity of stock: 97%
Lot/batch No.: 895-157
Radiochemical purity (if radiolabelling): 99%
Specific activity (if radiolabelling): 3.02 µCi/mM
Other: Total quantity of 53 mg dicyclopentadiene-14C was diluted with 600 mg nonradioactive dicyclopentadiene to form stock used for all pharmacokinetic and metabolism studies.

Test animal: rat, Sprague-Dawley, male

Weight at study initiation: 180-280 g
Fasting period before study: 18 h
Housing: individually in Roth metabolism cages
Individual metabolism cages: yes
Diet :.Purina Rat chow (ad libitum)
Water: ad libitum
Route of administration: oral: gavage
Vehicle: corn oil
Preparation of dosing solutions:
- 53 mg DCPD-14C diluted with 600 mg non-radioactive dicyclopentadiene to form stock.
- dosing solution prepared in corm oil and contained 20 mg dicyclopentadiene-14C (specific activity 0.20 µCi/mg) per mL corn oil.
Doses: Single dose, 100 mg/kg bw.
No. of animals per sex per dose: 12
Control animals: no

Details on dosing and sampling:
PHARMACOKINETIC STUDY (Absorption, distribution, excretion)
- Tissues and body fluids sampled: blood, urine, faeces, expired carbon dioxide , spleen, lungs, heart, liver, kidneys, testes, brain, abdominal muscle, fat, urinary bladder, adrenals, eyes, femur, skin, gall bladder, small intestine, large intestine, caecum and stomach.,
- Time and frequency of sampling: urine, faeces and expired carbon dioxide collected for 24 h and then every 24 h thereafter until all were killed.
Blood samples collected from aorta from 2 rats/time period, killed at 2, 4, 6, 24, 48 and 72 hours after dosing with dicyclopentadiene-14C.
- Other: Expired carbon dioxide was absorbed by a mixture containing ethanolamine:methyl cellusolve:toluene (1:8:10v/v)

METABOLITE CHARACTERISATION STUDIES
- Tissues and body fluids sampled : urine
- Time and frequency of sampling: 0 - 24 h
- From how many animals: 2 per time point (samples pooled)
- Method type(s) for identification: TLC
- Other: Radioactive spots on the TLC plates were localised by scanning with a radiochromatogram scanner.

Results and discussions:
Details on absorption: Absorption was rapid, Cpmax was 23.28 µg/ml at 6 h. Concentrations were greater in plasma than blood. Elimination from plasma was biphasic, the terminal half life was 27h.
Details on distribution in tissues: Radioactivity was widely distributed, Cmax at 2-6 hours, highest concentrations were in the fat, adrenals and urinary bladder. Radioactivity was still detectable in all tissues at 72 hours.
Details on excretion: The primary route of excretion of 14C was via urine. 94% of radioactivity was recovered within 72 h with approximately 75% in urine.
Details on metabolites: Metabolites identified. Urine contained 7 radioactive components; the major polar component accounted for 41% of the total radioactivity. No DCPD was detected. Conjugates were present.

Bioaccessibility: Average plasma and whole blood levels (µg/ml) of 14 C radioactivity in rats after a single oral dose of dicyclopentadiene-14C

Time point (post dose)	15 m	30 m	1 h	2 h	4 h	6 h	24 h	48 h	72 h
Blood	-	-	-	10.65	11.92	19.76	14.09	1.93	0.47
Plasma	-	-	-	11.51	14.44	23.28	15.47	2.13	0.36

Key: m = minutes, h = hour

Conclusions:

Dicyclopentadiene was rapidly absorbed, radioactivity was widely distributed into tissues. The terminal elimination half life from plasma was 27 hours. Excretion was primarily in urine; a total of 94% of radioactivity was recovered within 72 h with approximately 75% in urine. 7 radiolabelled components were separated in the 0-24h urine collection; these included conjugates but no dicyclopentadiene.

Reliability: 2 (reliable with restrictions)

Study 2

Data source: ECHA website - Exp Key Basic toxicokinetics.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/2/2/?documentUUID=740fb879-898f-4789-92f3-3131723ae8ea

Study reference:

Author not specified. Report date 1976-06-24.

Detailed study summary and results:

Type of method: in vivo
Objective of study: absorption, distribution, excretion, metabolism.
Test guideline: No guideline available
Principles of method: Rates of absorption, tissue distribution, metabolism and rate of excretion of 14C labelled dicyclopentadiene.
GLP compliance: no data

Test material identity: 3a,4,7,7a-tetrahydro-4,7-methanoindene, CAS 77-73-6
Radiolabelling: yes 14C

Name of test material (as cited in study report): Dicyclopentadiene (DCPD -14C)
Physical state: uniformly labelled with 14C
Analytical purity of stock: 97%
Lot/batch No.: 895-157
Radiochemical purity (if radiolabelling): 99%
Specific activity (if radiolabelling): 3.02 µCi/mM

Other: Total quantity of 53 mg dicyclopentadiene-14C was diluted with 600 mg nonradioactive dicyclopentadiene to form stock used for all pharmacokinetic and metabolism studies.

Test animal: dog, Beagle, male
Source: Hazleton Laboroatories, Cumberland, Virginia, USA
Weight at study initiation: 7.6 - 8.9 kg
Fasting period before study: 18 h
Housing: individually in stainless steel metabolism cages
Individual metabolism cages: yes
Diet :. Purina Dog chow (ad libitum)
Water: ad libitum
Route of administration: oral: unspecified
Vehicle: corn oil

Preparation of dosing solutions:
- 53 mg DCPD-14C diluted with 600 mg non-radioactive dicyclopentadiene to form stock.
- dosing solution prepared in corn oil and contained 50 mg dicyclopentadiene-14C (specific activity 0.04 µCi/mg) per mL corn oil.
Doses: Single dose, 100 mg/kg bw.
No. of animals per sex per dose: 5
Control animals: no

Details on dosing and sampling:
PHARMACOKINETIC STUDY (Absorption, distribution, excretion)
- Tissues and body fluids sampled: blood, urine, faeces, spleen, lungs, heart, liver, kidneys, testes, brain, abdominal muscle, fat, urinary bladder, adrenals, eyes, femur, skin, gall bladder, small intestine, large intestine, caecum, stomach., medulla, cerebrum, cerebellum, thyroid, lymph nodes, spinal cord, bone marrow, pancreas, pituitary, bile, lens, cornea, ocular fluid and ocular tissue.
- Time and frequency of sampling: urine and faeces collected from individual dogs for each 24 h period until all were killed.
blood samples collected from femoral vein 0.5, 1, 2, 4, 6, 10 and 24 hours after dosing with DCPD-14C and then at each subsequent 24 hour interval until all dogs were killed.

METABOLITE CHARACTERISATION STUDIES
- Tissues and body fluids sampled : urine
- Time and frequency of sampling: 0 - 24 h
- From how many animals: 2 per time point (samples pooled)
- Method type(s) for identification: TLC
- Other: Radioactive spots on the TLC plates were localised by scanning with a radiochromatogram scanner.

Results and discussions:
Details on absorption: Absorption was rapid, Cpmax was 39.9 µg/ml at 2 h. Concentrations were greater in plasma than blood. Elimination from plasma was biphasic with half lives of 10 and 18h.
Details on distribution in tissues: Radioactivity was widely distributed, Cmax at 4-24 hours, highest concentrations were in the bile, gall bladder, bladder and stomach. Radioactivity was still detectable in most tissues at 7 days.
Details on excretion: The primary route of excretion of 14C was via urine. 85% of radioactivity was recovered within 72 h with approximately 81% in urine.

Details on metabolites: Metabolites identified. Urine contained 6 radioactive components; the major polar component accounted for 81% of the total radioactivity. No DCPD was detected. Conjugates were present.
Bioaccessibility: The distribution of radioactivity in the eye was assessed. The highest levels were in all parts of the eye at 4 h. After that time, radioactivity was greatly reduced but was still detected in all parts of the eye at 7 days.

Conclusions:

DCPD was rapidly absorbed, radioactivity was widely distributed into tissues. Elimination from plasma was biphasic with half lives of 10 and 18 hours. Excretion was primarily in urine; a total of 85% of radioactivity was recovered within 72 h with approximately 81% in urine. 6 radiolabelled components were separated in the 0-24h urine collection; these included conjugates but no DCPD. There may be some biliary excretion in dogs.

Reliability: 2 (reliable with restrictions)

Study 3

Data source: ECHA website - Exp Key Basic toxicokinetics.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/2/2/?documentUUID=014070f0-a68c-4c4f-8403-cea70ec64e51

Study reference:

Author not specified. Report date 1976-06-24.

Detailed study summary and results:

Type of method: in vivo
Objective of study: absorption, distribution, metabolism, excretion.
Test guideline: No guideline available
Principles of method: Rates of absorption, tissue distribution, metabolism and rate of excretion of 14C labelled dicyclopentadiene.
GLP compliance: no data

Test material identity: 3a,4,7,7a-tetrahydro-4,7-methanoindene, CAS 77-73-6
Radiolabelling: yes 14C

Name of test material (as cited in study report): Dicyclopentadiene (DCPD -14C)
Physical state: uniformly labelled with 14C
Analytical purity of stock: 97%
Lot/batch No.: 895-157
Radiochemical purity (if radiolabelling): 99%
Specific activity (if radiolabelling): 3.02 µCi/mM
Other: Total quantity of 53 mg dicyclopentadiene-14C was diluted with 600 mg nonradioactive dicyclopentadiene to form stock used for all pharmacokinetic and metabolism studies.

Test animal: mouse, Swiss Webster, male
Weight at study initiation: 20 - 30 g

Fasting period before study: 18 h
Housing: in 3s in Roth metabolism cages
Individual metabolism cages: yes
Diet :. Purina mouse chow (ad libitum)
Water: ad libitum
Route of administration: oral: gavage
Vehicle: corn oil

Preparation of dosing solutions:
- 53 mg dicyclopentadiene-14C diluted with 600 mg non-radioactive dicyclopentadiene to form stock.
- dosing solution prepared in corn oil and contained 5 mg dicyclopentadiene-14C (specific activity 1.0 µCi/mg) per mL corn oil.
Doses: Single dose, 40 mg/kg bw.
No. of animals per sex per dose: 24
Control animals: no

PHARMACOKINETIC STUDY (Absorption, distribution, excretion)
- Tissues and body fluids sampled: blood, urine, faeces, expired carbon dioxide , spleen, lungs, heart, liver, kidneys, testes, brain, abdominal muscle, fat, urinary bladder, adrenals, eyes, femur, skin, gall bladder, small intestine, large intestine, caecum and stomach.,
- Time and frequency of sampling: urine, faeces and expired carbon dioxide collected for 24 h and then every 24 h thereafter until all were killed.
blood samples collected from aorta from 3 mice/time period, killed at 2, 4, 6, 24, 48 and 72 hours after dosing with dicyclopentadiene-14C (samples pooled).
- Other: Expired carbon dioxide was absorbed by a mixture containing ethanolamine:methyl cellusolve:toluene (1:8:10 v/v)

METABOLITE CHARACTERISATION STUDIES
- Tissues and body fluids sampled : urine
- Time and frequency of sampling: 0 - 24 h
- From how many animals: 3 per time point (samples pooled)
- Method type(s) for identification: TLC
- Other: Radioactive spots on the TLC plates were localised by scanning with a radiochromatogram scanner.

Results and discussions:
Details on absorption: Absorption was rapid, Cpmax was 11.36µg/ml at 2 h. Concentrations were greater in plasma than blood. Elimination from plasma was biphasic with half lives of 4 and 18 h.
Details on distribution in tissues: Radioactivity was widely distributed, Cmax at 1-2 hours, highest concentrations were in the bladder, gall bladder and fat. Radioactivity was still detectable in most tissues at 72 hours.
Details on excretion: The primary route of excretion of 14C was via urine. 92% of radioactivity was recovered within 48 h with approximately 70% in urine.
Details on metabolites: Metabolites identified. Urine contained 7 radioactive components; the major polar component accounted for 56% of the total radioactivity. No DCPD was detected. Conjugates were present.

Conclusions:

DCPD was rapidly absorbed, radioactivity was widely distributed into tissues. Elimination from plasma was biphasic with a terminal half life of 18 hours. Excretion was primarily in

urine; a total of 92% of radioactivity was recovered within 48 h with approximately 70% in urine. 7 radiolabelled components were separated in the 0-24h urine collection; these included conjugates but no DCPD.

Reliability: 2 (reliable with restrictions)

Study 4

Data source: ECHA website - Exp Supporting Basic toxicokinetics.004
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/2/2/?documentUUID=229083ab-e8eb-4329-9fbb-bd659b48dfc1

Study reference:

Publication of Ivie GW and Oehler DD: Fate of dicyclopentadiene in a lactating cow. Bull. Environm. Contam. Toxicol. 24, 662-670 (1980 year)

Detailed study summary and results:

Type of method: in vivo
Objective of study: To evaluate the metabolic and residual behaviour of DCPD in cattle, and to determine if this compound or its metabolites are retained by edible tissues or secreted into milk.
Test guideline: no guideline followed
Principles of method: Blood samples, urine, faeces and milk were collected at intervals. The cow was killed 96 hours after dosing with [14C] dicyclopentadiene and several tissues were taken. Excretion and tissue retention were determined.
GLP compliance: no data

Test material identity: 3a,4,7,7a-tetrahydro-4,7-methanoindene, CAS 77-73-6
Radiolabelling: yes

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
Both unlabelled and radiocarbon-labelled (uniform [14C], 62.6 mg/mCi) samples of dicyclopentadiene were supplied by the U.S. Army Medical Bioengineering Research and Development Laboratory, Fort Detrick, MD.

Test animal: cattle, Jersey, female
Source: Milking herd of a local diary
Weight at study initiation: 293 kg
Housing: Initially in a small pen, 24 hours after final unlabelled dose moved to a stanchion
Diet : Coastal bermuda grass hay ad libitum plus 2 kg crushed grain concentrate at each milking
Route of administration: oral: capsule
Vehicle: no

Details on exposure:
Unlabelled: A single gelatin capsule containing 2.93 g of unlabelled dicyclopentadiene given daily for 5 consecutive days. The dose was equivalent to 10 mg/kg body weight/day.
Radiolabelled: A single oral dose of [14C]dicyclopentadiene to which had been added sufficient unlabeled dicyclopentadiene to make the total dose equivalent to 2.93 g of dicyclopentadiene (10.0 mg/kg). The total radiocarbon given the cow was 4x108 dpm. The specific activity was 137 dpm/µg. The [14C]dicyclopentadiene contained about 5-10 mL of solvent in addition to the dicyclopentadiene.

Duration and frequency of treatment / exposure: 5 daily doses unlabelled dicyclopentadiene; 24 hours later a single dose of labelled dicyclopentadiene

Doses / concentrations: 10 mg/kg bw
No. of animals per sex per dose: 1
Control animals: no

Details on study design: A lactating cow was dosed orally with 10 mg dicyclopentadiene/kg bw/day for 5 consecutive days. 24 hours following the 5th dose, the cow was catheterized and given a single oral dose of [14C]dicyclopentadiene, to which had been added unlabelled dicyclopentadiene to make the total dose 10 mg/kg bw. Following treatment, blood samples, urine and faeces were collected at intervals and the cow was milked every 12 hours. The cow was killed 96 hours after dosing with [14C]dicyclopentadiene and several tissues taken post mortem. Excretion and tissue retention was determined by analysis of the samples for the presence of radiocarbon and TLC and HPLC were used to resolve the radioactive components in the excreta and urine samples. Studies were also conducted to determine to what extent cow urine metabolites were in the form of glucuronide conjugates.

Details on dosing and sampling:
Tissues and body fluids sampled: Whole blood samples, urine and faeces were collected after 4, 8, 12, 24, 36, 48, 72 and 96 hours and the cow was milked every 12 hours.
The cow was killed 96 hours after dosing with [14C]dicyclopentadiene and several tissues (brain, fat, gall bladder, heart, kidney, liver, muscle, ovary, lung, adrenal, skin, spleen, urinary bladder and udder) taken post mortem.
Excretion and tissue retention was determined by analysis of the samples for the presence of radiocarbon and TLC and HPLC were used to resolve the radioactive components in the excreta and urine samples.
Studies were also conducted to determine to what extent cow urine metabolites were in the form of glucuronide conjugates.

Results and discussions:
Details on excretion: Radiocarbon was quite rapidly excreted following oral dosing of [14C]dicyclopentadiene. (c.a. 81% of administered [14C] eliminated in urine, c.a. 4% in faeces, <0.1% secreted into milk). Radiocarbon in whole blood reached maximum levels (290 dpm/g) within 2 hr of dosing. Blood radiocarbon levels then declined rapidly, residues were not detectable (<20 dpm/g) in samples collected more than 24 hr after treatment. None of the tissue samples collected contained detectable radiocarbon residues.
Details on metabolites: Metabolites identified. In urine, glucuronide conjugates possibly formed through epoxidation of one or both of the dicyclopentadiene double bonds followed by hydrolysis of the epoxides to diols (or possibly epoxy diols or tetraols), then ultimately conjugation with glucuronic acid.

Bioaccessibility: Only exceedingly low levels of radiocarbon appeared in milk, and residues were not detected in samples collected more than 48 hr post-treatment.
Little was learned about the chemical nature of dicyclopentadiene metabolites except that, in urine, they are primarily in the form of glucuronide conjugates. It may well be that these metabolites in the cow arose, at least in part, through epoxidation of one or both of the dicyclopentadiene double bonds followed by hydrolysis of the epoxides to diols (or possibly epoxy diols or tetraols), then ultimately conjugation with glucuronic acid.

Conclusions:

Dicyclopentadiene undergoes rapid and extensive metabolism in the lactating cow following oral exposure. Of the total radiolabelled dose administered about 86% was recovered in the urine and faeces, and only trace amounts were secreted into milk. The fact that more than 80% of the administered dose was ultimately excreted in the urine and only about 4% in faeces indicates that the orally administered dicyclopentadiene was extensively absorbed from the gastrointestinal tract. Little was learned about the chemical nature of the metabolites during this study except that, in urine, they are primarily in the form of glucuronide.

Executive summary: Radiocarbon was quite rapidly excreted after oral administration of [14C]dicyclopentadiene to a lactating cow . c.a. 81% eliminated in urine, c.a. 4% in faeces and <0.1% secreted into milk. Radiocarbon in whole blood reached maximum levels (290 dpm/g) within 2 hr of dosing and then declined rapidly. Residues were not detectable (<20 dpm/g) in blood samples 24 hr after treatment. None of the tissue samples collected contained detectable radiocarbon residues.
Little was learned about the chemical nature of dicylopentadiene metabolites except that, in urine, they are primarily in the form of glucuronide conjugates.

Reliability: 2 (reliable with restrictions)

Study 5

Data source: HSDB: DICYCLOPENTADIENE - Absorption, Distribution & Excretion
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39

Detailed study summary and results:

In general, although some dicyclopentadiene can be exhaled unchanged, most of that absorbed is hydroxylated in the liver, undergoes glucuronide conjugation, and is excreted in the urine.

Study 6

Data source: HSDB: DICYCLOPENTADIENE - Absorption, Distribution & Excretion
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 4:203

Detailed study summary and results:

Dicyclopentadiene is predicted to be rapidly absorbed and distributed following any route of administration. It is extensively absorbed from the GI tract.

Study 7

Data source: HSDB: DICYCLOPENTADIENE - Absorption, Distribution & Excretion
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

IPCS, CEC; International Chemical Safety Card on Dicyclopentadiene. (October 2005). Available from, as of October 03, 2006

Detailed study summary and results:

The substance can be absorbed into the body by inhalation and by ingestion.

Study 8

Data source: HSDB: DICYCLOPENTADIENE - Metabolism/ Metabolites
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

WAYNE G; OEHLER DD; BULL ENVIRON CONTAM TOXICOL 24 (5): 662-70 (1980)

Detailed study summary and results:

When given by oral admin to lactating cows, metabolites were present in urine mainly in form of glucuronide conjugates. It is suggested that epoxidation of double bonds occurred, followed by hydrolysis of epoxides to diols & conjugation with glucuronic acid.

Study 9

Data source: HSDB: DICYCLOPENTADIENE - Metabolism/ Metabolites
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

USEPA; Health and Environmental Effects Profile for Cyclopentadiene and Dicyclopentadiene p.16 (1987) ECAO-CIN-G012

Detailed study summary and results:

... Urinary metabolites of dicyclopentadiene were not identified specifically, but analysis by thin layer chromatography indicated that the urine of mice and rats each had seven components. Six components were found in the urine of dogs. The Rf values of these components were similar; therefore, common metabolites were indicated in all three species. Only 1-3% of the radioactivity was attributed to nonmetabolized (14)carbon-dicyclopentadiene in all three species. When the urine from all species was subjected to enzymatic hydrolysis by glusulase (beta glucuronidase and sulfatase) and extracted, was recovered in the extract, indicating the presence of urine conjugates.

3. HEALTH HAZARDS

3.1 Acute toxicity

3.1.1 Acute oral toxicity

Acute oral toxicity - animal data

Study 1

Data source: ECHA website - Exp Key Acute toxicity: oral.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/2/?documentUUID=1d08558f-b67d-4956-819c-e785213588b2

Study reference:

Author not specified. Report date 1989-01-17.

Detailed study summary and results:

Groups of 5 male and 5 female Sprague Dawley rats (fasted overnight) were dosed by gavage at levels of 500, 794, 1260 or 2000 mg/kg dicycolpentadiene and were observed daily for 14 days after dosing. At the 4 hour observation period rats dosed with high levels of dicyclopentadiene (1260 or 2000 mg/kg bw) had hunched posture, piloerection, lethargy and decreased respiratory rate, with ptosis and occasional signs of ataxia seen in those dosed at 2000 mg/kg bw. All rats dosed at 1260 or 2000 mg/kg bw died one or two days after dosing. Haemorrhagic lungs, dark liver and sloughing of the non-glandular gastric epithelium was seen in decedents. The LD50 was calculated to be 590 mg/kg bw (male/female), 512 mg/kg (male) and 676 mg/kg/bw (female).

Test type:

Test type: standard acute method
Limit test: no
Test guideline: according to OECD Guideline 401 (Acute Oral Toxicity)
GLP compliance: yes

Test substance:

CAS number: 77-73-6
Name of test material (as cited in study report): DCPD 75%

Physical state: clear, yellow-coloured liquid
Composition of test material, percentage of components: 71.1% endo dicyclopentadiene, 0.8% exo dicyclopentadiene, 1.4% m-bicyclozonadiene, 15.2% CPD-MCPD codimers, 0.3% tricyclopentadiene, 1.3% CPD-butadiene codimer, 0.3% CPD-piperylene codimer, 0.3% CPD-isoprene codimer, <0.1% benzene , remainder misc. hydrocarbons.
Specific gravity: 0.971
Storage condition of test material: room temperature

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female
Source: Interfauna (UK) Ltd., Wyton, Huntingdon, Cambridgeshire, UK
Age at study initiation: 5-8 weeks
Weight at study initiation: males 120-146 g; females 120-150 g
Fasting period before study: overnight
Housing: In groups of up to 5, sexes separately in solid floor polypropylene cages with sawdust bedding
Diet: Rat and Mouse Expanded Diet No. 1 (Special Diet Services Ltd., Witham, Essex, UK) ad libitum (except for overnight fast immediately prior to dosing and approximately 2 hours after dosing)
Water: Mains drinking water ad libitum
Acclimation period: At least 5 days

ENVIRONMENTAL CONDITIONS
Temperature: 20-21°C
Humidity: 45-68%
Air changes (per hr): approx 15
Photoperiod: 12 hrs dark / 12 hrs light

IN-LIFE DATES: From: 22 September 1988 To: 18 October 1988

Administration/exposure:

Route of administration: oral: gavage
Vehicle: unchanged (no vehicle)
Maximum dose volume applied: 2.06 mL/kg
Minimum dose volume applied: 0.51 mL/kg
Doses: 500, 794, 1260 and 2000 mg/kg bw
No. of animals per sex per dose: 5
Control animals: no
Duration of observation period following administration: 14 days
Frequency of observations and weighing: Observed 1 and 4 hours after dosing and once daily thereafter.
Body weights: recorded on day of dosing (day 0), days 7, 14 or at death.
Necropsy of survivors performed: yes
Statistics: The acute oral LD50 and 95% confidence limits calculated using the probit method.

Results and reliability:

LD50 (rat, male/female) = 590 mg/kg bw
95% CL = 393 886
LD50 (rat, male) = 512 mg/kg bw
95% CL = 227 1155
LD50 (rat, female) = 676 mg/kg bw
95% CL = 444 1030

Mortality: All deaths occurred one or two days following dosing. There were 2, 4, 5 and 5 male deaths and 1, 2, 5 and 5 female deaths in the 500, 794, 1260 and 2000 mg/kg bw groups respectively.

Clinical signs: Hunched posture, piloerection, lethargy and decreased respiratory rate were present in all animals during the day of dosing. Ptosis was occasionally noted in animals dosed with 794 or 1260 mg/kg during this period. All rats dosed with 2000 mg/kg had ptosis 1 and 4 hours after dosing with occasional signs of ataxia at the 4 hour observation. Vocalisation was noted in one rat dosed with 1260 mg/kg at the 4 hour observation. Red/brown staining around the snout was present in surviving animals treated with 500 or 794 mg/kg one day after dosing. All survivors appeared normal 2 days after dosing.

Body weight: All surviving animals showed expected body weight gain.

Gross pathology: Haemorrhagic lungs, dark liver and sloughing of the non-glandular gastric epithelium were seen in decedents. No abnormalities were seen in animals killed at the end of the study.

Conclusions: The acute oral LD50 and 95% confidence limits of dicyclopentadiene 75% were calculated to be 590 (393-886) mg/kg bw for males and females combined; 512 (227-1155) mg/kg bw for males and 676 (444-1030) mg/kg bw for females.

Reliability: 1 (reliable without restriction)

Study 2

Data source: ECHA website - Exp Supporting Acute Toxicity: oral.002
Link:http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/2/?documentUUID=71539c8b-9b99-43a8-9d9a-54b72a715135

Study reference:

Author not specified. Report date 1976-06-24

Detailed study summary and results:

In an acute oral toxicity study in fasted Sprague Dawley rats, gavage administration of dicyclopentadiene (in corn oil) at doses of between 278 and 793 mg/kg, caused signs of toxicity including red stains around the mouth and nose, decreased activity, occasional ataxia and prostration 1-4 hours after dosing. Some instances of convulsions and tremors were reported but not all of these rats later died. Hyperaemia of the lungs was observed at necropsy in some animals that died during the study but there were no gross abnormalities in rats which survived to the end of the study. The acute LD50 in fasted rats was calculated to be 449 mg/kg (male/female), 520 mg/kg (male) and 378 mg/kg (female).

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 401 (Acute Oral Toxicity)
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: waxy solid, liquefied on slight warning
Analytical purity: 98-99% pure dicyclopentadiene
Impurities (identity and concentrations): Trace - one may be the cis-form.
Lot/batch No.: LBI No. 763A

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female

Source: ARS/Sprague Dawley, Madison, Wisconsin, USA
Age at study initiation: no data
Weight at study initiation: no data
Fasting period before study: overnight prior to dosing
Housing: individually in suspended wire cages
Diet: Purina Laboratory chow ad libitum except overnight prior to dosing
Water: ad libitum
Acclimation period: not reported

Administration/exposure:

Route of administration: oral: gavage
Vehicle: corn oil
Concentration in vehicle: 196 mg/mL
Justification for choice of vehicle: poor water solubility
Lot/batch no.: Mazola corn oil (no other details reported)
Doses: 278, 360, 464, 600 and 793 mg/kg
No. of animals per sex per dose: 10
Control animals: no
Duration of observation period following administration: 14 days
Frequency of observations: Observations on day of dosing and daily thereafter.
Body weights: recorded on day of dosing and on days 7 and 14.
Necropsy of survivors performed: yes
Other examinations performed: clinical signs, body weight, gross pathology
Statistics: LD50 values and 95% confidence limits were calculated (Biometrics, Vol 12, pp 311, 1956)

Results and reliability:

LD50 (rat, male/female) = 449 mg/kg bw

LD50 (rat, male) = 520 mg/kg bw
95% CL = 420 465
LD50 (rat, female) = 378 mg/kg bw
95% CL = 303 473

Mortality: see table below.

Table: Mortality in fasted rats following oral dose of dicyclopentadiene
Males:

	Deaths on day:					
Dose (mg/kg)	1	2	3	4	5-14	Total mortality / total no. rats
278	0	1	0	0	0	1/10
360	0	2	0	0	0	2/10
464	0	3	0	0	0	3/10
600	0	7	1	0	0	8/10
793	0	7	1	0	0	8/10

Females:

	Deaths on day:					
Dose (mg/kg)	1	2	3	4	5-14	Total mortality / total no. rats
278	0	0	0	0	0	0/10
360	0	5	0	0	0	5/10
464	0	7	0	0	0	7/10
600	0	9	0	0	0	9/10
793	0	10	0	0	0	10/10

Clinical signs: Red stains around the mouth and nose, decreased activity, occasional ataxia and prostration 1-4 hours after dosing. Some instances of convulsions and tremors were reported but not all of these rats later died.

Gross pathology: Of those rats that died during the study, hyperaemia of the lungs was present in some but most showed no abnormalities. At necropsy of surviving rats, there were no gross abnormalities.

Conclusions: The acute LD50 of dicyclopentadiene in fasted rats was calculated to be 449 mg/kg (male/female), 520 mg/kg (male) and 378 mg/kg(female).

Reliability: 2 (reliable with restrictions)

Study 3
Data source: ECHA website - Exp Supporting Acute Toxicity: oral.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/2/?documentUUID=a473243a-f16c-4abc-98a3-f0ace379254b

Study reference:

Author not specified. Report date 1976-06-24.

Detailed study summary and results:

In an acute oral toxicity study in fasted Swiss Webster mice, gavage administration of dicyclopentadiene (in corn oil) at doses of between 167 and 600 mg/kg, caused signs of toxicity including decreased activity and prostration within 1-4 hours after dosing. Hyperaemia of the lungs, distension of the bladder, yellow fluid in the stomach and small intestines and black discolouration of areas of the liver and spleen were observed at necropsy in some animals that died during the study, but there were no gross abnormalities in mice which survived to the end of the study. The acute LD50 in fasted mice was calculated to be 220 mg/kg (male/female), 190 mg/kg (male) and 250 mg/kg (female).

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 401 (Acute Oral Toxicity)
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: waxy solid, liquefied on slight warning
Analytical purity: 98-99% pure DCPD
Impurities (identity and concentrations): Trace - one may be the cis-form.
Lot/batch No.: LBI No. 763A

Test animals:

Species: mice
Strain: Swiss Webster
Sex: male/female

Source: Camm Research, Wayne, New Jersey, USA
Age at study initiation: no data
Weight at study initiation: no data
Fasting period before study: overnight prior to dosing
Housing: in groups of 5 by sex in solid -bottom plastic cages
Diet: Purina Laboratory chow ad libitum except overnight prior to dosing
Water: ad libitum
Acclimation period: not reported

Administration/exposure:

Route of administration: oral: gavage
Vehicle: corn oil
Concentration in vehicle: 10% v/v
Justification for choice of vehicle: poor water solubility

Lot/batch no.: Mazola corn oil (no other details reported)
Doses: 167, 215, 278. 360. 464 and 600 mg/kg
No. of animals per sex per dose: 10
Control animals: no
Duration of observation period following administration: 14 days
Frequency of observations: Observations on day of dosing and daily thereafter.
Body weights: recorded on day of dosing and on days 7 and 14.
Necropsy of survivors performed: yes
Other examinations performed: clinical signs, body weight, gross pathology
Statistics: LD50 values and 95% confidence limits were calculated (Biometrics, Vol 12, pp 311, 1956)

Results and reliability:

LD50 (mouse, male/female) = 220 mg/kg bw
LD50 (mouse, male) = 190 mg/kg bw
95% CL = 125 289
LD50 (mouse, female) = 250 mg/kg bw
95% CL = 170 368

Mortality: see table below.

Table: Mortality following acute oral dose of dicyclopentadiene in mice
Males:

	Deaths on day:					
Dose (mg/kg)	1	2	3	4	5-14	Total mortality / total no. rmice
167	3	2	0	0	0	5/10
215	4	1	0	0	0	5/10
278	3	2	0	0	1	6/10
360	5	2	0	0	0	7/10
464	2	6	0	0	0	8/10
600	6	3	0	0	1	10/10

Females:

	Deaths on day:					
Dose (mg/kg)	1	2	3	4	5-14	Total mortality / total no.mice
167	0	0	0	0	0	0/10
215	3	3	0	0	0	610
278	2	1	0	0	0	3/10
360	2	7	0	0	0	9/10
464	3	2	0	0	0	5/10
600	4	5	0	0	0	9/10

Clinical signs: Decreased activity and prostration seen within 1-4 hours after dosing.

Gross pathology: Gross findings in animals which died during the study included yellow fluid in the stomach and small intestines, distension of the bladder with pinkish-orange fluid,

hyperaemia of the lungs and black discolouration of portions of the liver and spleen. There were no macroscopic abnormalities in animals that survived to the end of the study.

Conclusions: The acute LD50 of dicyclopentadiene in fasted mice was calculated to be 220 mg/kg (male/female), 190 mg/kg (male) and 250 mg/kg (female)

Reliability: 2 (reliable with restrictions)

Study 4

Data source: US EPA Screening-level hazard characterization Document, December 2010 - Human Health Hazard, Acute Oral Toxicity
Link:http://www.epa.gov/chemrtk/hpvis/hazchar/Category_Resin%20Oils_December_2010.pdf

Study reference:

Smyth et al., 1962

Detailed study summary and results:

Male Wistar rats (5/dose) were administered a single dose of CASRN 77-73-6 via gavage at unspecified concentrations and observed for 14 days. Mortality data were not reported. LD50 = 410 mg/kg

Test type:

Test guideline: no data
GLP compliance: no data

Test substance:

Name of test material: Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: no data
Analytical purity: DCPD high purity

Test animals:

Species: rat
Strain: Wistar
Sex: male

Administration/exposure:

Route of administration: oral: gavage
Vehicle: no data
Doses: no data

No. of animals per dose: 5
Duration of observation period following administration: 14 days

Results and reliability:

LD50 (rat, male) = 410 mg/kg bw
Mortality: not reported

Reliability: this information is taken from a reliable peer reviewed source: US EPA Screening-level hazard characterization Document, December 2010.

Study 5

Data source: US EPA Screening-level hazard characterization Document, December 2010 - Human Health Hazard, Acute Oral Toxicity
Link:http://www.epa.gov/chemrtk/hpvis/hazchar/Category_Resin%20Oils_December_2010.pdf

Study reference:

Kinkead et al., 1971

Detailed study summary and results:

Rats (sex/strain/number not specified) were administered a single dose of undiluted CASRN 77-73-6 via gavage at unspecified concentrations. Mortality data were not reported. LD50 = 353 mg/kg

Test type:

Test guideline: no data
GLP compliance: no data

Test substance:

Name of test material: Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: no data
Analytical purity: DCPD high purity

Test animals:

Species: rat
Strain: no data
Sex: no data

Administration/exposure:

Route of administration: oral: gavage

Vehicle: no
Doses: no data
No. of animals per sex per dose: no data
Duration of observation period following administration: no data

Results and reliability:

LD50 (rat) = 353 mg/kg bw
Mortality: not reported

Reliability: this information is taken from a reliable peer reviewed source: US EPA Screening-level hazard characterization Document, December 2010.

Study 6

Data source: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Values
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39

Detailed study summary and results:

LD50 Cattle oral 1200 mg/kg

Test type:

Test guideline: no data
GLP compliance: no data

Test substance:

Name of test material: Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: no data
Analytical purity: no data

Test animals:

Species: cattle
Strain: no data
Sex: no data

Administration/exposure:

Route of administration: oral:unspecified
Vehicle: no data
Doses: no data

No. of animals per sex per dose: no data
Duration of observation period following administration: no data

Results and reliability:

LD50 (cattle, oral) = 1200 mg/kg
Mortality: no data

Reliability: this information is suitable for use for this endpoint because it is taken from a reliable peer reviewed database: HSDB.

Acute oral toxicity - human data

No data available.

Acute oral toxicity - other data

No data available.

3.1.2 Acute dermal toxicity

Acute dermal toxicity - animal data

Study 1

Data source: ECHA website - Exp Key Acute toxicity: dermal.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/4

Study reference:

Author not specified. Report date 1989-01-17.

Detailed study summary and results:

The acute dermal toxicity of dicyclopentadiene 75% was assessed in a group of 5 male and 5 female rats. 2.06 mL/kg body weight was applied to the shorn flank and held in place with an occlusive dressing. Animals were observed at 1 and 4 hours after dosing and then daily for 14 days. Clinical signs present on day 1 included vocalisation lasting up to 30 minutes (noted in all animals after dosing), hunched posture, lethargy, piloerection, erythema and oedema, . Isolated incidences of red/brown staining of snout and ptosis were seen. All animals showed signs of eschar by day 3 which persisted until days 10 or 12. All treatment sites appeared normal by the end of study. All animals gained weight and there were no gross abnormalities at necropsy. The acute dermal LD50 of dicyclopentadiene 75% in the rat was greater than 2000 mg/kg body weight.

Test type:

Test type: standard acute method
Limit test: yes

Test guideline: according to OECD Guideline 402 (Acute Dermal Toxicity)
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): DCPD 75%
CAS number: 77-73-6
Physical state: clear, yellow-coloured liquid
Composition of test material, percentage of components: 71.1% endo dicyclopentadiene, 0.8% exo dicyclopentadiene, 1.4% m-bicyclozonadiene, 15.2% CPD-MCPD codimers, 0.3% tricyclopentadiene, 1.3% CPD-butadiene codimer, 0.3% CPD-piperylene codimer, 0.3% CPD-isoprene codimer<0.1% benzene , remainder misc. hydrocarbons.
Specific gravity: 0.971
Storage condition of test material: room temperature

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female
Source: Interfauna (UK) Ltd., Wyton, Huntingdon, Cambridgeshire, UK
Age at study initiation: 8-12 weeks
Weight at study initiation: males 231-256 g; females 210-255 g
Fasting period before study: None
Housing: Solid floor polypropylene cages with sawdust bedding
Diet: Rat and Mouse expanded Diet No. 1 (Special Diet Services Ltd., Witham, Essex, UK) ad libitum
Water: Mains drinking water ad libitum
Acclimation period: At least 5 days

ENVIRONMENTAL CONDITIONS
Temperature: 20-21°C
Humidity: 45-68%
Air changes: approximately 15 per hour
Photoperiod: 12 hrs dark / 12 hrs light
IN-LIFE DATES: From: 22 September 1988 To: 6 October 1988

Administration/exposure:

Type of coverage: occlusive
Vehicle: unchanged (no vehicle)
TEST SITE
Area of exposure: shorn skin on back and flanks
% coverage: 10%
Type of wrap if used: aluminium foil occluded with double layers of adhesive strapping wound around trunk of animal

REMOVAL OF TEST SUBSTANCE
Washing (if done): with moist cotton wool
Time after start of exposure: 24 hours

TEST MATERIAL
Amount(s) applied (volume or weight with unit): 2.06 mL/kg bodyweight
Constant volume or concentration used: yes

Duration of exposure: 24 hours
Doses: 2000 mg/kg bodyweight
No. of animals per sex per dose: 5
Control animals: no
Duration of observation period following administration: 14 days
Frequency of observations and weighing: Observed 1 and 4 hours after dosing and daily thereafter for 14 days. Bodyweights recorded on day of treatment and on days 7 and 14
Necropsy of survivors performed: no
Statistics: None, acute LD50 estimated.

Results and discussion:

LD50 (male/female) > 2000 mg/kg bw

Mortality: none
Clinical signs: Vocalisation, lasting up to 30 minutes, noted in all animals after dosing. Hunched posture, lethargy, piloerection, erythema and oedema present in all animals on day 1. Isolated incidences of red/brown staining of snout and ptosis seen. All animals showed signs of eschar by day 3 which persisted until days 10 or 12. All treatment sites appeared normal by end of study.
Body weight: All animals showed expected bodyweight gain.
Gross pathology: No abnormalities were seen.

Conclusions: The acute dermal LD50 of dicyclopentadiene 75% to the rat was greater than 2000 mg/kg body weight.

Reliability: 1 (reliable without restriction)

Study 2

Data source: ECHA website - Exp Supporting Acute toxicity: dermal.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/4/?documentUUID=96f510ed-0431-41bb-8b85-ab50fc0761dc

Study reference:

Author not specified. Publication 1962.

Detailed study summary and results:

The acute dermal toxicity of dicyclopentadiene was assessed in male New Zealand white rabbits. Dicyclopentadiene was applied to an area of clipped, intact dorsal skin and held in place with an occlusive dressing for 24 hours and the animals observed daily for 14 days. The LD50 was 4.46 mL/kg bodyweight, approximately equivalent to 4460 mg/kg.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 402 (Acute Dermal Toxicity)
GLP compliance: no

Test substance:

CAS number: 77-73-6
Name: 3a,4,7,7a-tetrahydro-4,7-methanoindene

Test animals:

Species: rabbit
Strain: New Zealand White
Sex: male
Weight at study initiation: 2.5-3.5 kg

Administration/exposure:

Type of coverage: occlusive
Vehicle: unchanged (no vehicle)

TEST SITE
Area of exposure: Fur removed from the entire trunk by clipping and the dose retained beneath an impervious plastic film.

REMOVAL OF TEST SUBSTANCE
Washing (if done): no data
Time after start of exposure: 24 hours

Duration of exposure: 24 hours
Doses: Not reported
No. of animals per sex per dose: 4
Control animals: no data
Duration of observation period following administration: 14 days
Statistics: Dermal LD50 (and its fiducial range) estimated. Methods used are not detailed (probit analysis assumed).

Results and discussion:

LD50 (male) = 4.46 mL/kg bw = 4460 mg/kg
95% CL = 2.44 8.15

Mortality: No data
Clinical signs: No data
Body weight: No data
Gross pathology: No data

Conclusions: The acute dermal LD50 of dicyclopentadiene in the New Zealand White rabbit was 4.46 mL/kg bodyweight, approximately equivalent to 4460 mg/kg.
Reliability: 2 (reliable with restrictions)

Study 3

Data source: ECHA website - Exp Supporting Acute toxicity: dermal.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/4/?documentUUID=47d3afcd-4396-4e17-bca4-b68a04678ab6

Study reference:

Publication: Smyth HF, Carpenter CP, Weil CS and Pozzani UC, "Range-Finding Toxicity Data List V" Arch Ind Hyg Occup. 1954 Vol 10 pp 61-68

Detailed study summary and results:

The acute dermal toxicity of dicyclopentadiene was assessed in groups of male New Zealand white rabbits. Dicyclopentadiene was applied to an area of clipped, intact dorsal skin and held in place with an occlusive dressing for 24 hours. The acute dermal LD50 of dicyclopentadiene in the rabbit was 6.72 mL/kg bodyweight, equivalent to 6720 mg/kg.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 402 (Acute Dermal Toxicity)
Deviations: yes, study pre-dates guideline
GLP compliance: no

Test substance:

Name of test material (as cited in study report): cyclopentadiene dimer
CAS number: 77-73-6

Test animals:

Species: rabbit
Strain: New Zealand White
Sex: male
Weight at study initiation: 2.5-3.5 kg

Administration/exposure:

Type of coverage: occlusive
Vehicle: no data

TEST SITE
Area of exposure: The fur was closely clipped over the entire trunk
% coverage: About 1/10 of the body surface.
Type of wrap if used: Impervious plastic film

REMOVAL OF TEST SUBSTANCE
Washing (if done): no data
Time after start of exposure: 24 hours

Duration of exposure: 24 hours
Doses: up to 20 mL/kg.
No. of animals per sex per dose: 4
Control animals: no data
Duration of observation period following administration: 14 days
Frequency of observations and weighing: no details
Necropsy of survivors performed: no details
Essentially method of Draize

Results and discussion:

LD50 (male) = 6.72 mL/kg bw = 6720 mg/kg
95% CL = 3.15 14.36

Mortality: No data
Clinical signs: No data
Body weight: No data
Gross pathology: No data

Conclusions: The acute dermal LD50 of dicyclopentadiene to the rabbit was 6.72 ml/kg bodyweight, equivalent to 6720 mg/kg.

Reliability: 2 (reliable with restrictions)

Study 4

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 5.1.3 Acute dermal toxicity
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

Toxicol. Appl. Pharmacol., 20, 552, (1971)

Detailed study summary and results:

LD50 (rabbit) = 5080 mg/kg b.w.

Test type:

Test guideline: no data
GLP compliance: no

Test substance:

Name of test material: Dicyclopentadiene
CAS number: 77-73-6
Purity: unknown

Test animals:

Species: rabbit
Strain: no data
Sex: no data

Administration/exposure:

Type of coverage: no data
Vehicle: no data
Duration of exposure: no data
Doses: no data
No. of animals per sex per dose: no data
Control animals: no data

Results and discussion:

LD50 (rabbit) = 5080 mg/kg bw

Mortality: no data
Clinical signs: no data
Body weight: no data
Gross pathology: no data

Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Study 5

Data source: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Values
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

European Chemicals Bureau; IUCLID Dataset, 3a,4,7,7a-Tetrahydro-4,7-methanoindene (77-73-6) (2000 CD-ROM edition)
Remarks: source is not available now

Detailed study summary and results:

LD50 Rabbit dermal 4380 mg/kg

Test type:

Test guideline: no data
GLP compliance: no data

Test substance:

Name of test material: Dicyclopentadiene
CAS number: 77-73-6
Purity: unknown

Test animals:

Species: rabbit
Strain: no data
Sex: no data

Administration/exposure:

Type of coverage: detmal:unspecified
Vehicle: no data
Duration of exposure: no data
Doses: no data
No. of animals per sex per dose: no data
Control animals: no data

Results and discussion:

LD50 Rabbit dermal 4380 mg/kg

Mortality: no data
Clinical signs: no data
Body weight: no data
Gross pathology: no data

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Study 6

Data source: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Values
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Verschueren, K. Handbook of Environmental Data of Organic Chemicals. 2nd ed. New York, NY: Van Nostrand Reinhold Co., 1983., p. 513

Detailed study summary and results:

LD50 Rat percutaneous 4.46 mL/kg

Test type:

Test guideline: no data
GLP compliance: no data

Test substance:

Name of test material: Dicyclopentadiene
CAS number: 77-73-6
Purity: unknown

Test animals:

Species: rat
Strain: no data
Sex: no data

Administration/exposure:

Type of coverage: percutaneous
Vehicle: no data
Duration of exposure: no data
Doses: no data
No. of animals per sex per dose: no data
Control animals: no data

Results and discussion:

LD50 Rat percutaneous 4.46 mL/kg

Mortality: no data
Clinical signs: no data
Body weight: no data
Gross pathology: no data

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Acute dermal toxicity - human data

Study 1

Data source: HSDB: DICYCLOPENTADIENE - Human Toxicity Excerpts
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

IPCS, CEC; International Chemical Safety Card on Dicyclopentadiene. (October 2005). Available from, as of October 03, 2006

Detailed study summary and results:

/SIGNS AND SYMPTOMS/ ACUTE ... SYMPTOMS: Skin--redness and pain.

Acute dermal toxicity - other data

No data available.

3.1.3 Acute inhalation toxicity

Acute inhalation toxicity - animal data

Study 1

Data source: ECHA web-site - Exp Key Acute toxicity: inhalation.004
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=82df06fc-bc89-4e8b-9bdf-2162c101e2b6

Study reference:

Author not specified. Report date 1981-04-29.

Detailed study summary and results:

Groups of 6 male and 6 female B6C3F1 mice were exposed (whole body) to 46, 130, 260 or 557 ppm dicyclopentadiene vapour for 6 hours and then observed daily for up to 14 days. At 557 and 260 ppm, all animals died within 24 hours of exposure. At 130 ppm, 2 males were found dead on the day after exposure, 1 female died immediately post exposure and 2 died on the day following exposure. There were no deaths at 46 ppm. C linical signs included loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, clear nasal discharge, loss of coordination and convulsions prior to death. The LC50 was 143 ppm (male) and 126 ppm (female), equivalent to 774 and 703 mg/m3 respectively.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
Deviations: yes 6 hour exposure
GLP compliance: yes

Test substance:

CAS number: 77-73-6
Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
Physical state: clear colourless liquid at room temperature
Analytical purity: ~97% endo- and ~1% cyclopentadiene

Test animals:

Species: mouse
Strain: B6C3F1
Sex: male/female

TEST ANIMALS
Source: Harlan Industries Inc., Indianapolis, Indiana, USA
Age at study initiation: approximately 6-7 weeks old
Weight at study initiation: no data
Fasting period before study: no data

Housing: 2 per cage in stainless steel cages
Diet: powdered chow diet ad libitum except during exposure
Water: ad libitum except during exposure
Acclimation period: approximately 2 weeks

ENVIRONMENTAL CONDITIONS
Temperature: 69-74°F
Humidity: 30-63%
Photoperiod: 12 hrs dark /12 hrs light

IN-LIFE DATES: no data

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

GENERATION OF TEST ATMOSPHERE / CHAMBER DESCRIPTION
Dicyclopentadiene vapour was generated inside a heated Pyrex tube to achieve complete vaporization while keeping temperature below the point (35°C) at which fracturing to monomer occurred.

TEST ATMOSPHERE
Chamber concentrations of DCPD and cyclopentadiene (CPD) were monitored by gas chromatography/flame ionization detection with detection limit of 0.05 ppm for both compounds.

Analytical verification of test atmosphere concentrations: yes by gas chromatography/flame ionization detection
Duration of exposure: 6 h
Target concentrations were 50, 150, 300 and 600 ppm.
Actual exposure concentrations were 46, 130, 260 and 557ppm.
No. of animals per sex per dose: 6
Control animals: no data
Duration of observation period following administration: 14 days
Frequency of observations: animals were observed daily for clinical signs
Necropsy of survivors performed: yes
Statistics: LC50 was calculated by the method of moving averages.

Results and discussion:

LC50 (male) = 143 ppm
95% CL = 130 157
Exp. Duration = 6 h
Remarks = 774 mg/m3 air (analytical)

LC50 (female) = 130 ppm
95% CL = 103 153
Exp. Duration = 6 h
Remarks = 703 mg/m3 (analytical)

LC50 (male/female) = 738.5 mg/m³ air (analytical)

Exp. Duration = 6 h

NOAEC (male/female) for irregular breathing, stereotypic behaviour = 46 ppm
Remarks = 248.74 mg/m3

Mortality: There were mortalities in male and female mice exposed to 557 and 260 ppm. (The actual numbers of mice dying at the various exposure levels were not presented in the report)

Incidence of mortality following single 6-hour inhalation exposure

Target Concentration (ppm)	Dead/dosed		Comment
	male	female	
600	6/6	6/6	Males: 3 dead during exposure. 1 died immediately post-exposure and 1 post-exposure. 1 died the day following exposure. Females: 1 dead during exposure. 2 died immediately post-exposure. 3 died the day following exposure.
300	6/6	6/6	Males: All found dead the day after exposure. Females: 1 dead during exposure. 3 died immediately post-exposure. 2 died the day following exposure.
150	2/6	3/6	Males: 2 found dead the day after exposure. Females: 1 died immediately post-exposure. 2 died the day following exposure.
50	0/6	0/6	

Clinical signs: Male and female mice at 557 ppm showed loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, clear nasal discharge and deaths. At 260 ppm, both sexes showed stereotypic behaviour, respiratory difficulty, impaired gait, loss of coordination and convulsions prior to death. At 130 ppm, mice displayed irregular breathing and stereotypic behaviour; females also showed loss of coordination and slight tremors. No treatment-related clinical signs were observed in mice exposed to 46 ppm.

Body weight: no data
Gross pathology: There were no gross pathological effects noted at necropsy.

Conclusions: Following a 6 hour whole body, inhalation exposure to dicyclopentadiene vapour, the LC50 was 143 (130-157) ppm (male) and 126 (103-153) ppm (emale). The results were not confounded by the fracturing of dicyclopentadiene into cyclopentadiene. The male/female 6 hour LC50 is equivalent to 738.5 mg/m3.

Reliability: 1 (reliable without restriction)

Study 2

Data source: ECHA web-site - Exp Key Acute toxicity: inhalation.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=e5f7b048-d4e3-4a3c-9581-88c5438f307e

Study reference:

Author not specified. Report date 1981-04-29.

Detailed study summary and results:

Groups of 6 male and 6 female Fischer 344 rats were exposed (whole body) to 46, 130, 260 or 557 ppm dicyclopentadiene vapour for 6 hours and then observed daily for up to 14 days. At 557 ppm, one male died during exposure, 3 died immediately post-exposure and 2 were found dead on the day after exposure; all females were found dead on the day after exposure. At 260 ppm, two males were found dead on the day after exposure, all females survived. Clinical signs included loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, nasal discharge and convulsions. The LC50 was 284 ppm (male) and 353 ppm (female), equivalent to 1536 and 1910 mg/m3 respectively.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
Deviations: yes 6 hour exposure
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: clear colourless liquid at room temperature
Analytical purity: ~97% endo- and ~1% cyclopentadiene

Test animals:

Species: rat
Strain: Fischer 344
Sex: male/female

TEST ANIMALS
Source: Microbiological Associates, Walkersville, Maryland, USA
Age at study initiation: no data
Weight at study initiation: no data
Fasting period before study: no
Housing: 2 per cage in stainless steel cages
Diet: powdered chow diet ad libitum except during exposure
Water: ad libitum except during exposure
Acclimation period: approximately 2 weeks

ENVIRONMENTAL CONDITIONS
Temperature: 69-74°F
Humidity: 30-63%
Photoperiod: 12 hrs dark /12 hrs light

IN-LIFE DATES: no data

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

GENERATION OF TEST ATMOSPHERE / CHAMBER DESCRIPTION
Dicyclopentadiene vapour was generated inside a heated Pyrex tube to achieve complete vaporization while keeping temperature below the point (35°C) at which fracturing to monomer occurred.

TEST ATMOSPHERE
Chamber concentrations of dicyclopentadiene and cyclopentadiene (CPD) were monitored by gas chromatography/flame ionization detection with detection limit of 0.05 ppm for both compounds.

Analytical verification of test atmosphere concentrations: yes by gas chromatography/flame ionization detection
Duration of exposure: 6 h
Target concentrations were 50, 150, 300 and 600 ppm.
Actual exposure concentrations were 46, 130, 260 and 557 ppm.
No. of animals per sex per dose: 6
Control animals: no data
Duration of observation period following administration: 14 days
Frequency of observations: animals were observed daily for clinical signs
Necropsy of survivors performed: yes
Statistics: LC50 was calculated by the method of moving averages.

Results and discussion:

LC50 (male) = 284 ppm
95% CL = 236 341
Exp. Duration = 6 h
Remarks = 1536 mg/m3 air (analytical)

LC50 (female) = 353 ppm
95% CL = 322 387
Exp. Duration = 6 h
Remarks = 1910 mg/m3 air (analytical)

LC50 (male/female) = 1723 mg/m³ air (analytical)
Exp. Duration = 6 h

NOAEC (male/female) for irregular breathing, stereotypic behaviour = 46 ppm
Remarks = 248.74 mg/m3

Mortality: There were mortalities in male and female rats exposed to 557 or 260 ppm. (The actual numbers of rats dying at the various exposure levels were not presented in the report).

Incidence of mortality following single 6-hour inhalation exposure

Target Concentration (ppm)	Dead/dosed		Comment
	male	female	
600	6/6	6/6	Males: One died during exposure. 3 died immediately post-exposure. 2 found dead on the day after exposure. Females: All found dead on the day after exposure.
300	2/6	0/6	Males: 2 found dead the day after exposure.
150	0/6	0/6	
50	0/6	0/6	

Clinical signs: Male and female rats at 557 ppm showed loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, nasal discharge, convulsions and death. At 260 ppm, both sexes showed stereotypic behaviour, respiratory difficulty and nasal discharge. In rats dying from exposure to dicyclopentadiene, convulsions were observed immediately before death. At 130 ppm, the only sign observed in both sexes, was a somewhat sluggish movement. No treatment-related clinical signs were observed in rats exposed to 46 ppm. In rats that did not die during the study, all clinical signs cleared by day 2.

Body weight: no data
Gross pathology: There were no gross pathological effects noted at necropsy.

Conclusions: Following a 6 hour whole body, inhalation exposure to dicyclopentadiene vapour, the LC50 was 284 (236-341) ppm (male) and 353 (322-387) ppm (female). The results were not confounded by the fracturing of dicyclopentadiene into cyclopentadiene. The male/female 6 hour LC50 is equivalent to 1723 mg/m3.

Reliability: 1 (reliable without restriction)

Study 3

Data source: ECHA web-site - Exp Supporting Acute toxicity: inhalation.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=64467e0d-31fd-4bb9-b21d-2e6f6c5a11ea

Study reference:

Author not specified. Publication, 1971

Detailed study summary and results:

Groups of 6 male and female albino rats were exposed (whole body) to dicyclopentadine vapour for 4 hours and then observed daily for up to 14 days. The lowest effect level was 272 ppm, which caused irritation of the extremities within 60 minutes in males and females and the death of one male. The acute inhalation LC50 was 359.4 ppm (male) and 385.2 ppm (female) equivalent to 1943 and 2083 mg/m3, respectively.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
GLP compliance: no

Test substance:

Name of test material (as cited in study report): Isomeric mixture of endo/exo dicyclopentadiene in a 95:5 ratio
CAS number: 77-73-6
Physical state: Clear colourless liquid
Purity: 98.3 %
Molecular weight: 132.21
Boiling point at 100 mm Hg: 105°C
Specific gravity: 0.9825 at 20/20°C
Flash point (Tag upon cup): 150°F
Vapour pressure at 20°C: 1.4 mm
Melting point: 16-18°C

Test animals:

Species: rat
Strain: other: albino
Sex: male/female
Weight: 105-214 g (males), 100-176 g (females)

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

Analytical verification of test atmosphere concentrations: yes, gas chromatography
Duration of exposure: 4 h
Concentrations: no data
No. of animals per sex per dose: 6
Control animals: no data
Details on study design: 14 day observation period following 4 hour exposure
Statistics:no data

Results and discussion:

LC50 (male) = 359.4 ppm
95% CL = 290.2 445.1
Exp. Duration = 4 h
Remarks = 1943 mg/m3

LC50 (female) = 385.2 ppm
95% CL = 311.1 477.1
Exp. Duration = 4 h
Remarks = 2083 mg/m3

Mortality: 1 male died at 272 ppm.

Clinical signs: The lowest concentration at which effects were seen was 272 ppm where irritation of extremities was seen within 60 minutes in both males and females. Eye irritation, poor coordination and convulsions were generally observed prior to death. No other details were reported.

Body weight: Survivors gained weight during the 14 day observation period.
Gross pathology: No data

Conclusions: Following a 4 hour, whole body, inhalation exposure to dicyclopentadine vapour, the LC50 for rats was 359.4 ppm (male) and 385.2 ppm (female) equivalent to 1943 and 2083 mg/m3, respectively.

Reliability: 2 (reliable with restrictions)

Study 4

Data source: ECHA web-site - Exp Supporting Acute toxicity: inhalation.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=2aa40c8f-1d60-460c-939d-1b8afaf4c3cf

Study reference:

Author not specified. Publication, 1971

Detailed study summary and results:

Individual female beagle dogs were exposed (whole body) to dicyclopentadiene vapour for 4 hours and then observed daily for up to 14 days. 773 ppm was lethal to the 1 female dog within 1 hour of exposure; clinical signs included irritation of eyes, nose and extremities within 30 minutes, followed by tonic and clonic convulsions preceding death. During exposure, tremors were seen at 458 and 272 ppm, eye and nose irritation and lacrimation were also observed during exposure to 458 ppm. The only clinical sign seen at 68 ppm was urination immediately following exposure. The 4 hour inhalation LC50 in the dog was therefore between 458-773 ppm.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
Deviations: yes 1 dog/group
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): Isomeric mixture of endo/exo dicyclopentadiene in a 95:5 ratio
CAS number: 77-73-6

Physical state: Clear colourless liquid
Purity: 98.3 %
Molecular weight: 132.21
Boiling point at 100 mm Hg: 105°C
Specific gravity: 0.9825 at 20/20°C
Flash point (Tag upon cup): 150°F
Vapour pressure at 20°C: 1.4 mm
Melting point: 16-18°C

Test animals:

Species: dog
Strain: other: other: Beagle
Sex: female
Weight: 7100, 7600, 7700 and 10800 g

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

Analytical verification of test atmosphere concentrations: yes, gas chromatography
Duration of exposure: ca. 1 ca. 4 h
Concentrations: 68, 272, 458 and 773 ppm (measured concentrations)
No. of animals per sex per dose: 1
Control animals: no data
Details on study design: 14 day observation period following 4 hour exposure
Statistics:no data

Results and discussion:

LC50 (female) = 458 - 773 ppm
Exp. Duration = 4 h

LC50 (female) = 2478 - 4181 mg/m³ air
Exp. Duration = 4 h

Mortality: After 1 hour exposure at 773 ppm one female died.

Clinical signs:
773 ppm: irritation of eyes, nose and extremities within 30 minutes, followed by tonic and clonic convulsions preceding death within 60 minutes.
458 ppm: tremors within 15 minutes, with eye and nose irritation and lacrimation within 50 minutes, no death.
272 ppm: tremors within 180 minutes.
68 ppm (approximate): dog urinated small amounts, several times immediately following exposure.

Body weight: No data
Gross pathology: No data

Conclusions: 4 hour inhalation of 773 ppm dicyclopentadiene vapour was lethal to the 1 female dog tested. 458 ppm caused changes in clinical condition but was not lethal.

Reliability: 2 (reliable with restrictions)

Study 5

Data source: ECHA website - Exp Supporting Acute toxicity: inhalation.006
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=4056d3d0-f4fe-49ac-b036-e60d8078c5aa

Study reference:

Author not specified. Publication, 1971

Detailed study summary and results:

Groups of 6 male mice were exposed (whole body) to dicyclopentadiene vapour for 4 hours and then observed daily for up to 14 days. 272 ppm caused tonic convulsions in one mouse within 75 minutes and all mice died within 24 hours of exposure. At 110 ppm, one mouse died but there were no other clinical effects. The 4 hour acute inhalation LC50 was 145.5 (117.5 -180.2) ppm in male mice, equivalent to 787 mg/m3.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
GLP compliance: no

Test substance:

Name of test material (as cited in study report): Isomeric mixture of endo/exo dicyclopentadiene in a 95:5 ratio
CAS number: 77-73-6
Physical state: Clear colourless liquid
Purity: 98.3 %
Molecular weight: 132.21
Boiling point at 100 mm Hg: 105°C
Specific gravity: 0.9825 at 20/20°C
Flash point (Tag upon cup): 150°F
Vapour pressure at 20°C: 1.4 mm
Melting point: 16-18°C

Test animals:

Species: mouse
Strain: other: no data
Sex: male
Weight: 31-41 g

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

Analytical verification of test atmosphere concentrations: yes, gas chromatography
Duration of exposure: 4 h
Concentrations: no data
No. of animals per sex per dose: 6
Control animals: no data
Details on study design: 14 day observation period following 4 hour exposure
Statistics:no data

Results and discussion:

LC50 (male) = 145.5 ppm
95% CL = 117.5 180.2
Exp. Duration = 4 h

LC50 (male) = 787 mg/m³ air (analytical)
Exp. Duration = 4 h

Mortality: All mice died within 24 hours following exposure to 272 ppm. One mouse died at 110 ppm.

Clinical signs: 272 ppm caused tonic convulsions in one mouse within 75 minutes. There were no clinical effects at 110 ppm.

Body weight: No data.
Gross pathology: No data

Conclusions: Following a 4 hour, whole body, inhalation exposure to dicyclopentadine vapour, the LC50 for male mice was 145.5 (117.5 -180.2) ppm equivalent to 787 mg/m3.

Reliability: 2 (reliable with restrictions)

Study 6

Data source: ECHA website - Exp Supporting Acute toxicity: inhalation.005
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=66b17854-39c8-4548-8b0c-2f2db4d6a116

Study reference:

Author not specified. Publication, 1971

Detailed study summary and results:

Groups of 4 male rabbits were exposed (whole body) to dicyclopentadiene vapour for 4 hours and then observed daily for up to 14 days. Poor coordination was seen within 180 minutes at

458 ppm. The acute inhalation LC50 was 771 (555.2 - 1177) ppm in male rabbits, equivalent to 4171 mg/m3

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
Deviations: yes rabbit
GLP compliance: no

Test substance:

Name of test material (as cited in study report): Isomeric mixture of endo/exo dicyclopentadiene in a 95:5 ratio
CAS number: 77-73-6
Physical state: Clear colourless liquid
Purity: 98.3 %
Molecular weight: 132.21
Boiling point at 100 mm Hg: 105°C
Specific gravity: 0.9825 at 20/20°C
Flash point (Tag upon cup): 150°F
Vapour pressure at 20°C: 1.4 mm
Melting point: 16-18°C

Test animals:

Species: rabbit
Strain: no data
Sex: male
Weight: 1912-2568 g

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

Analytical verification of test atmosphere concentrations: yes, gas chromatography
Duration of exposure: 4 h
Concentrations: no data
No. of animals per sex per dose: 4
Control animals: no data
Details on study design: 14 day observation period following 4 hour exposure
Statistics:no data

Results and discussion:

LC50 (male) = 771 ppm
95% CL = 505.2 1177
Exp. Duration = 4 h
Remarks = 4171 mg/m3 (analytical)

Mortality: No mortality
Clinical signs: Poor coordination seen within 180 minutes at 458 ppm.
Body weight: No data
Gross pathology: No data

Conclusions: Following a 4 hour, whole body, inhalation exposure to dicyclopentadine vapour, the LC50 was 771.0 (555.2 - 1177) ppm in male rabbits, equivalent to 4171 mg/m3.

Reliability: 2 (reliable with restrictions)

Study 7

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 5.1.2 Acute inhalation toxicity
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

Brit.J. Industr. Med., 27,1 (1970)

Detailed study summary and results:

LC50 (rat) = 1000 ppm/4H
Exp. Duration = 4 h

Test type:

Test guideline: no data
GLP compliance: no

Test substance:

Name of test material: Dicyclopentadiene
CAS number: 77-73-6
Purity: unknown

Test animals:

Species: rat
Strain: no data
Sex: no data

Administration/exposure:

Route of administration: inhalation:unspecified
Doses: no data
No. of animals per sex per dose: no data
Control animals: no data

Results and discussion:

LC50 (rat) = 1000 ppm/4H

Mortality: no data
Clinical signs: no data
Body weight: no data
Gross pathology: no data

Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Study 8

Data source: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Values
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Hartley, D. and H. Kidd (eds.). The Agrochemicals Handbook. 2nd ed. Lechworth, Herts, England: The Royal Society of Chemistry, 1987., p. A716/Aug 87

Detailed study summary and results:

LC50 Rat inhalation 660 mg/L/4 hr

Test type:

Test guideline: no data
GLP compliance: no

Test substance:

Name of test material: Dicyclopentadiene
CAS number: 77-73-6

Test animals:

Species: rat
Strain: no data
Sex: no data

Administration/exposure:

Route of administration: inhalation:unspecified
Doses: no data
No. of animals per sex per dose: no data
Control animals: no data

Results and discussion:

LC50 (rat) = 660 mg/L/4 hr

Mortality: no data
Clinical signs: no data
Body weight: no data
Gross pathology: no data

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Study 9

Data source: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Values
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39

Detailed study summary and results:

LC50 Rat inhalation 500 ppm/4 hr

Test type:

Test guideline: no data
GLP compliance: no

Test substance:

Name of test material: Dicyclopentadiene
CAS number: 77-73-6

Test animals:

Species: rat
Strain: no data
Sex: no data

Administration/exposure:

Route of administration: inhalation:unspecified
Doses: no data
No. of animals per sex per dose: no data
Control animals: no data

Results and discussion:

LC50 (rat) = 500 ppm/4 hr

Mortality: no data
Clinical signs: no data
Body weight: no data
Gross pathology: no data

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Study 10

Data source: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Values
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39

Detailed study summary and results:

LC50 Mouse inhalation 145 ppm/4 hr

Test type:

Test guideline: no data
GLP compliance: no

Test substance:

Name of test material: Dicyclopentadiene
CAS number: 77-73-6

Test animals:

Species: mouse
Strain: no data
Sex: no data

Administration/exposure:

Route of administration: inhalation:unspecified
Doses: no data
No. of animals per sex per dose: no data
Control animals: no data

Results and discussion:

LC50 (mouse) = 145 ppm/4 hr

Mortality: no data
Clinical signs: no data

Body weight: no data
Gross pathology: no data

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Study 11

Data source: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Values
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:39

Detailed study summary and results:

LC50 Guinea pig inhalation 770 ppm/4 hr

Test type:

Test guideline: no data
GLP compliance: no

Test substance:

Name of test material: Dicyclopentadiene
CAS number: 77-73-6

Test animals:

Species: guinea pig
Strain: no data
Sex: no data

Administration/exposure:

Route of administration: inhalation:unspecified
Doses: no data
No. of animals per sex per dose: no data
Control animals: no data

Results and discussion:

LC50 (guinea pig) = 770 ppm/4 hr

Mortality: no data
Clinical signs: no data
Body weight: no data
Gross pathology: no data

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Acute inhalation toxicity - human data

Study 1

Data source: HSDB: DICYCLOPENTADIENE - Human Toxicity Excerpts
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

IPCS, CEC; International Chemical Safety Card on Dicyclopentadiene. (October 2005). Available from, as of October 03, 2006.

Detailed study summary and results:

/SIGNS AND SYMPTOMS/ ACUTE ... SYMPTOMS: Inhalation--cough, sore throat, and headache.

Acute inhalation toxicity - other data

No data available.

3.2 Skin corrosion/irritation

Skin corrosion/irritation - animal data

Study 1

Data source: ECHA website - Exp Key Skin irritation/corrosion.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/4/2/?documentUUID=108e3195-88b7-4f89-a980-8513510fa63c

Study reference:

Author not specified. Report date 1989-01-17.

Detailed study summary and results:

Skin irritation was assessed in a group of 3 New Zealand white rabbits. 0.5 mL of dicyclopentadiene 75% was applied to an area of clipped, intact skin under a semi-occlusive dressing for 4 hours. Animals were observed at 1 and 4 hours after removal of the patch and then daily for 7 days. Well-defined erythema and slight to severe oedema was present at skin sites of all rabbits at 24, 48 and 72 hour observations. On day 7 no oedema was noted but there were signs of possible hyperkeratinisation. No other adverse dermal reactions were noted during the study. The overall mean scores (24, 48 & 72 hr) were 2 for erythema and 2.3 for oedema.

Test type:

Type of method: in vivo
Test guideline: according to OECD Guideline 404 (Acute Dermal Irritation / Corrosion)

GLP compliance: yes

Test substance:

Name of test material (as cited in study report): DCPD 75%
CAS number: 77-73-6
Physical state: clear, yellow coloured liquid
Analytical purity: not reported
Composition of test material, percentage of components: endo dicyclopentadiene: 71.1, exo dicyclopentadiene: 0.8, m-bicyclozonadiene: 1.4, CPD-MCPD codimers: 15.2, tricyclopentadiene: 0.3, CPD-butadiene codimer: 1.3, CPD-piperylene codimer: 0.3, CPD-isoprene codimer: 0.3, benzene: <0.1, misc.hydrocarbons: balance.
Lot/batch No.: PD Sample 1
Stability: Not determined
Specific gravity (15/15°C) 0.9811
Other: Gardner colour: 4+; total sulfur: 60 ppm (w/w); flashpoint 39°C pct (w/w)

Test animals:

Species: rabbit
Strain: New Zealand White

TEST ANIMALS
Source: David Percival Ltd., Moston, Sandbach, Cheshire, UK
Age at study initiation: 12-16 weeks
Weight at study initiation: 2.22-2.54kg
Housing: Individually in suspended metal cages
Diet: Rabbit Diet ad libitum (Preston Farmers Ltd., New Leake, Boston, Lincolnshire, UK)
Water: Mains water ad libitum
Acclimation period: At least 5 days

ENVIRONMENTAL CONDITIONS
Temperature: 16-22°C
Humidity: 54-67%
Air changes (per hr): Approximately 15/hour
Photoperiod: 12 hrs dark / 12 hrs light):

IN-LIFE DATES: From: 9 November 1988 To: 16 November 1988

Administration/exposure:

Type of coverage: semiocclusive
Preparation of test site: other: clipped
Vehicle: unchanged (no vehicle)
Amount/concentration applied: 0.5 mL
Duration of treatment / exposure: 4 hours
Observation period: 7 days
Number of animals: 3
Control animals: not required

TEST SITE

Area of exposure: 2.5 x 2.5 cm
% coverage: not specified
Type of wrap if used: gauze patch held in place with surgical adhesive tape under a Tubigrip corset

REMOVAL OF TEST SUBSTANCE
Washing (if done): swabbed with water
Time after start of exposure: 4 hr after application

SCORING SYSTEM: Draize scale

Results and discussion:

Irritation parameter: erythema score
Basis: mean
Time point: 24, 48 & 72 h
Score: 2
Max. Score: 4
Reversibility: fully reversible within: 7 days.
Remarks: possible hyperkeratinisation at 7 days in all 3 animals.

Irritation parameter: edema score
Basis: mean
Time point: 24, 48 & 72 h
Score: 2.3
Max. Score: 4
Reversibility: fully reversible within: 7 days.

Skin irritation scores according to the Draize scheme

Time	Erythema (Test/Control sites)			Oedema (Test/Control sites)		
Animal number	34F	43F	80M	34F	43F	80M
after 1 hour	1	2	1	1	2	1
after 24 hours	2	2	2	4	4	3
after 48 hours	2	2	2	2	2	1
after 72 hours	2	2	2	2	2	1
mean scores 24-72h	2	2	2	2.6	2.6	1.7
Overall mean score (24-72 h)	2			2.3		

Well-defined erythema persisted at all treated skin sites at 24, 48 and 72 hour observations. Signs of possible hyperkeratinisation were noted on day 7. No oedema was noted on day 7. No other adverse dermal reactions were noted during the study.

Conclusions: In a skin irritation study with dicyclopentadiene 75% in rabbits, overall mean scores (24, 48 & 72 hr) were 2 for erythema and 2.3 for oedema.

Reliability: 1 (reliable without restriction)

Study 2

Data source: ECHA website - Exp Supporting Skin irritation/corrosion.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/4/2/?documentUUID=149c0d74-d514-467a-b77c-81af107aeb0a

Study reference:

Author not specified. Publication 1962.

Detailed study summary and results:

Skin irritation was assessed in a group of New Zealand white rabbits. 0.01 mL of neat dicyclopentadiene was applied to an area of clipped, intact skin and left uncovered for 24 hours. The overall irritation score (on a scale of 1 -10) after 24 hours was 5. Undiluted dicyclopentadiene was therefore considered to be moderately irritating to rabbit skin.

Test type:

Type of method: in vivo
Test guideline: equivalent or similar to OECD Guideline 404 (Acute Dermal Irritation / Corrosion)
Deviations: yes, study pre-dates guideline
Principles of method if other than guideline: Primary skin irritation
GLP compliance: no

Test substance:

CAS number: 77-73-6
IUPAC Name: 3a,4,7,7a-tetrahydro-4,7-methanoindene

Test animals:

Species: rabbit
Strain: New Zealand White

Administration/exposure:

Type of coverage: open
Preparation of test site: shaved
Vehicle: no data
Amount/concentration applied: 0.01 mL (not stated if undiluted or solution)
Duration of treatment / exposure: 24 hours
Observation period: 24 hours
Number of animals: 5
Control animals: not required

Details on study design: Primary skin irritation was recorded in a 10-grade ordinal series based upon the severest reaction that developed on the clipped skin within 24 hours of the uncovered application.

Results and discussion:

Irritation parameter: overall irritation score
Basis: mean
Time point: 24 h
Score: 5

Max. Score: 10
Remarks: moderate irritant

Grade 1 indicated no irritation and Grade 2, the least visible capillary injection from the undiluted chemical. Responses above grade 6 indicated necrosis.

Reliability: 2 (reliable with restrictions)

Study 3

Data source: US EPA Screening-level hazard characterization Document, December 2010 - Human Health Hazard, Additional information, Skin Irritation. Data for Subcategory I: DCPD High Purity and related streams, DCPD High Purity (CASRN 77-73-6)
Link:http://www.epa.gov/chemrtk/hpvis/hazchar/Category_Resin%20Oils_December_2010.pdf

Study reference:

Author not specified. Reference is mentioned as "These data are summarized in TSCATS OTS0558246".

Detailed study summary and results:

Three New Zealand White rabbits (sex not reported) were administered CASRN 77-73-6 (75% pure; 0.5 mL) to clipped skin for 4 hours under semi-occlusive conditions and observed for 14 days. Well-defined erythema was observed within 3 days of exposure in all animals. Signs of keratinization were observed on day 7. Moderate edema was observed at 24 hours in all animals, and regressed to slight by day 3. The primary irritation index was 4.7.

Test type:

Test guideline: no data
GLP compliance: no data

Test substance:

CAS number: 77-73-6
Name of test material: DCPD 75%

Test animals:

Species: rabbit
Strain: New Zealand White

Administration/exposure:

Type of coverage: semi-occlusive
Preparation of test site: other: clipped
Amount/concentration applied: 0.5 mL
Duration of treatment / exposure: 4 hours

Observation period: 14 days
Number of animals: 3
Control animals: not required

Results and discussion:

Well-defined erythema was observed within 3 days of exposure in all animals. Signs of keratinization were observed on day 7. Moderate edema was observed at 24 hours in all animals, and regressed to slight by day 3. The primary irritation index was 4.7.

Reliability: this information is taken from a reliable peer reviewed source: US EPA Screening-level hazard characterization.

Study 4

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 5.2.1 Skin irritation/corrosion
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

Achiev. Ind. Hyg. Occp. Med., 10, 61 (1954)

Detailed study summary and results:

No detailes available. Result: Highly irritating.

Test type:

Test method: open irritaition test
GLP compliance: no

Test substance:

CAS number: 77-73-6
Name of test material: DCPD
Purity: unknown

Test animals:

Species: rabbit
Strain: no data

Administration/exposure:

Type of coverage: no data
Preparation of test site: no data
Amount/concentration applied: no data
Duration of treatment / exposure: no data
Observation period: no data
Number of animals: no data

Results and discussion:

Result states as Highly irritating.
Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Study 5

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 5.2.1 Skin irritation/corrosion
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

RTECS Database (Prehled Prumyslove Toxikologie, 50 (1986)

Detailed study summary and results:

No detailes available. Result: Moderate irritating.

Test type:

Test method: Standard Draize test
GLP compliance: no

Test substance:

CAS number: 77-73-6
Name of test material: DCPD
Purity: unknown

Test animals:

Species: rabbit
Strain: no data

Administration/exposure:

Type of coverage: no data
Preparation of test site: no data
Amount/concentration applied: 20 mg
Duration of treatment / exposure: 24 hours
Observation period: no data
Number of animals: no data

Results and discussion:

Result: Moderate irritating.

Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Skin corrosion/irritation - human data

Study 1

Data source: HSDB: DICYCLOPENTADIENE - Skin, Eye and Respiratory Irritations
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:38

Detailed study summary and results:

Dicyclopentadiene causes mild to severe eye, skin, and respiratory tract irritation, and severe response of the eyes and skin result from 24-hour exposure.

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Study 2

Data source: HSDB: DICYCLOPENTADIENE - Skin, Eye and Respiratory Irritations
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2005., p. 1

Detailed study summary and results:

... Eye and skin irritation from the undiluted material is relatively minor.

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Skin corrosion/irritation - other data

No data available.

3.3 Eye damage/eye irritation

Eye damage/eye irritation - animal data

Study 1

Data source: ECHA website - Exp Key Eye irritation.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/4/3

Study reference:

Author not specified. Report date 1989-01-17.

Detailed study summary and results:

Eye irritation was assessed in 3 New Zealand white rabbits. 0.1 mL dicyclopentadiene 75% was instilled into the conjunctival sac and the eyes were scored for irritation responses at 1, 24, 48 and 72 hours and at 7 days after instillation. At 1 hour, corneal dulling was present in 2 eyes, iridial inflammation and moderate conjunctival irritation were present in all 3 eyes, giving an overall mean score of 18.5 at 1 hour, which corresponds to moderate irritation (Kay and Callandra, 1962). Signs of irritation regressed to minimal in 2 eyes at 24 hours but persisted in 1 animal at 48 and 72 hours. All effects were fully reversible within 7 days. Dicyclopentadiene 75% was a moderate irritant to the rabbit eye at 1 hour but was practically non-irritating at 24, 48 and 72 hours.

Test type:

Type of method: in vivo
Test guideline: according to OECD Guideline 405 (Acute Eye Irritation / Corrosion)
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): DCPD 75%
CAS number: 77-73-6
Physical state: clear, yellow coloured liquid
Analytical purity: not reported
Composition of test material, percentage of components: endo dicyclopentadiene: 71.1, exo dicyclopentadiene: 0.8, m-bicyclozonadiene: 1.4, CPD-MCPD codimers: 15.2, tricyclopentadiene: 0.3, CPD-butadiene codimer: 1.3, CPD-piperylene codimer: 0.3, CPD-isoprene codimer: 0.3, benzene: <0.1, misc.hydrocarbons: balance.
Lot/batch No.: PD Sample 1
Stability: Not determined
Specific gravity (15/15°C) 0.9811
Other: Gardner colour: 4+; total sulfur: 60 ppm (w/w); flashpoint 39°C pct (w/w)

Test animals:

Species: rabbit
Strain: New Zealand White
TEST ANIMALS

Source: David Percival Ltd., Moston, Sandbach, Cheshire, UK
Age at study initiation: 12-16 weeks
Weight at study initiation: 2.45-2.67 kg
Housing: Individually in suspended metal cages
Diet: Rabbit Diet ad libitum (Preston Farmers Ltd., New Leake, Boston, Lincolnshire, UK)
Water: Mains water ad libitum
Acclimation period: At least 5 days

ENVIRONMENTAL CONDITIONS
Temperature: 15-20°C
Humidity: 40-66%
Air changes (per hr): Approximately 15/hour
Photoperiod: 12 hrs dark / 12 hrs light):

IN-LIFE DATES: From: 14 November 1988 To: 22 November 1988

Administration/exposure:

Vehicle: unchanged (no vehicle)
Amount/concentration applied: 0.1 mL
Duration of treatment / exposure: Single application
Observation period: 7 days
Number of animals: 3
Control animals: no

REMOVAL OF TEST SUBSTANCE
The eyes were not washed

SCORING SYSTEM:
According to the numerical system of Draize JH, 1959 and a modified version of the Kay and Calandra system, 1962

TOOL USED TO ASSESS SCORE:
Standard ophthalmoscope

Results and discussion:

Irritation parameter: cornea score
Basis: mean
Time point: 24- 72 h
Score: 0
Max. Score: 4

Irritation parameter: iris score
Basis: mean
Time point: 24- 72 h
Score: 0
Max. Score: 2

Irritation parameter: conjunctivae score
Basis: mean
Time point: 24- 72 h
Score: 0.43

Max. Score: 3
Reversibility: fully reversible within: 7 days
Remarks: slight redness present in 1 animal at 72 h.

Irritation parameter: chemosis score
Basis: mean
Time point: 24- 72 h
Score: 0.1
Max. Score: 4
Reversibility: fully reversible within: fully reversible within: 48 h
Remarks: slight chemosis in 1 rabbit at 24 h

Dicyclopentadiene 75%: Eye irritation scores according to the Draize scheme

Time	Cornea			Iris			Conjunctiva					
							Redness			Chemosis		
Animal number	545	544	547	545	544	547	545	544	547	545	544	547
after 1 hour	0	d	d	1	1	1	3	2	2	2	2	2
after 24 hours	0	0	0	0	0	0	1	1	0	0	1	0
after 48 hours	0	0	0	0	0	0	0	1	0	0	0	0
after 72 hours	0	0	0	0	0	0	0	1	0	0	0	0
mean scores 24-72h	0	0	0	0	0	0	0.3	1	0	0	0.3	0

d = dulling of corneal surface

Conclusions: Dicyclopentadiene 75% was a moderate irritant to the rabbit eye at 1 hour but was practically non-irritating at 24, 48 and 72 hours.

Reliability: 1 (reliable without restriction)

Study 2

Data source: ECHA website - Exp Supporting Eye irritation.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/4/3/?documentUUID=54566caf-0732-4abf-b841-92c543d8af27

Study reference:

Author not specified. Report date 1976-06-24.

Detailed study summary and results:

Eye irritation was assessed in 3 New Zealand white rabbits. 0.1 mL dicyclopentadiene was instilled into the conjunctival sac and the eyes were scored for irritation responses at 1, 2, 3, 4, 7 and 14 days after instillation. Some irritation of the conjunctivae was observed in 7 of the 9 rabbits following instillation. Irritation was reduced but not prevented by irrigation 2 or 4 seconds after application. In all cases, irritation was confined to the conjunctivae and all eyes were normal by the third day. Dicyclopentadiene was practically non-irritating at 24, 48 and 72 hours.

Test type:

Type of method: in vivo
Test guideline: no guideline available
Principles of method if other than guideline: Draize eye irritation test with irrigation after application.
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: waxy solid, liquefied on slight warning
Analytical purity: 98-99% pure DCPD
Impurities (identity and concentrations): Trace - one may be the cis-form
Lot/batch No.: LBI No. 763A

Test animals:

Species: rabbit
Strain: New Zealand White

Administration/exposure:

Vehicle: unchanged (no vehicle)
TEST MATERIAL
Amount(s) applied (volume or weight with unit): 0.1 mL
Other: liquid material

Duration of treatment / exposure:
3 rabbits : eye washed at 2 seconds after application
3 rabbits : eye washed at 4 seconds after application
3 rabbits : eyes not washed
Observation period: 14 days
Number of animals: 9
Control animals: no

REMOVAL OF TEST SUBSTANCE
Washing (if done): The treated eye was washed with 20 mL lukewarm water
Time after start of exposure: 2 seconds after application in 3 rabbits and 4 seconds after application in 3 rabbits
The eye was not washed in the remaining 3 rabbits

SCORING SYSTEM: Draize scoring system

Results and discussion:

Irritation parameter: conjunctivae score
Basis: mean
Time point: 24, 48, 72 h
Score: 0.89
Max. Score: 3
Reversibility: fully reversible within: 3 days
Remarks: eye not irrigated

Irritation parameter: conjunctivae score
Basis: mean
Time point: 24, 48, 72 h
Score: 0.22
Max. Score: 3
Reversibility: fully reversible within: 3 days
Remarks: eye irrigated at 2 seconds

Irritation parameter: conjunctivae score
Basis: mean
Time point: 24, 48, 72 h
Score: 0.78
Max. Score: 3
Reversibility: fully reversible within: 3 days
Remarks: eye irrigated at 4 seconds

Irritant/corrosive response data: In 7 of the 9 rabbits, some irritation of the conjunctivae was observed after treatment. Irritation was reduced but not prevented by irrigation 2 or 4 seconds after application. In all cases, irritation was confined to the conjunctivae and all eyes were normal by the third day.

Eye irritation scores according to the Draize scheme

Not Irrigated									
Time	Cornea			Iris			Conjunctiva		
Animal number	84	85	86	84	85	86	84	85	86
after 24 hours	0	0	0	0	0	0	1	1	1
after 48 hours	0	0	0	0	0	0	1	2	2
after 72 hours	0	0	0	0	0	0	0	0	0
mean scores 24-72h	0	0	0	0	0	0	0.67	1	1
Overall mean scores (24-72 h)	0			0			0.89		

Irrigated at 2 seconds									
Time	Cornea			Iris			Conjunctiva		
Animal number	88	75	76	88	75	76	88	75	76
after 24 hours	0	0	0	0	0	0	0	1	0
after 48 hours	0	0	0	0	0	0	0	1	0
after 72 hours	0	0	0	0	0	0	0	0	0
mean scores 24-72h	0	0	0	0	0	0	0	0.67	0
Overall mean scores (24-72 h)	0			0			0.22		

Irrigated at 4 seconds									
Time	Cornea			Iris			Conjunctiva		
Animal number	79	81	83	79	81	83	79	81	83
after 24 hours	0	0	0	0	0	0	0	1	1
after 48 hours	0	0	0	0	0	0	1	2	2
after 72 hours	0	0	0	0	0	0	0	0	0
mean scores 24-72h	0	0	0	0	0	0	0.33	1	1

Overall mean scores (24-72 h)	0	0	0.78

Conclusions: Dicyclopentadiene caused signs of conjunctival irritation in 7 out of 9 rabbits on day 1 or 2, which was reduced but not prevented by irrigation. All signs of irritation had recovered by day 3.

Reliability: 2 (reliable with restrictions)

Study 3

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 5.2.2 Eye irritation/corrosion
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

Achiev. Ind. Hyg. Occp. Med., 10, 61 (1954)

Detailed study summary and results:

No detailes available. Result: Irritating.

Test type:

Test method: open irritaition test
GLP compliance: no

Test substance:

CAS number: 77-73-6
Name of test material: DCPD
Purity: unknown

Test animals:

Species: rabbit
Strain: no data

Administration/exposure:

Type of coverage: no data
Preparation of test site: no data
Dose: 500 mg
Duration of treatment / exposure: no data
Observation period: no data
Number of animals: no data

Results and discussion:

Result: irritating.

Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Study 4

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 5.2.2 Eye irritation/corrosion
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

RTECS Database (Prehled Prumyslove Toxikologie, 50 (1986)

Detailed study summary and results:

No detailes available. Result: Moderate irritating.

Test type:

Test method: Standard Draize test
GLP compliance: no

Test substance:

CAS number: 77-73-6
Name of test material: DCPD
Purity: unknown

Test animals:

Species: rabbit
Strain: no data

Administration/exposure:

Type of coverage: no data
Preparation of test site: no data
Dose: 500 mg
Duration of treatment / exposure: 24h
Observation period: no data
Number of animals: no data

Results and discussion:

Result: Moderate irritating.

Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Eye damage/eye irritation - human data

Study 1

Data source: ECHA website - Exposure related observations in humans: Direct observations: clinical cases, poisoning incidents and other
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/11/4

Study reference:

Publication 1971. Author not specified.

Detailed study summary and results:

Test guideline: no guideline followed
Principles of method if other than guideline: Human sensory response.
GLP compliance: no data
Study type: study with volunteers

Endpoint addressed: eye irritation

Test substance:

Name of test material (as cited in study report): dicyclopentadiene
Physical state: Clear colourless liquid
Analytical purity: 96.7%, isomeric mixture of endo/exo in a 95:5 ratio
Molecular weight: 132.21
Boiling point at 100 mm Hg: 105°C
Specific gravity: 0.9816 at 20/20°C
Flash point (Tag upon cup): 150°F
Vapour pressure at 20°C, 1.4 mm
Melting point: 16-18°C
Inhibitor (tertiary butyl catechol), 141 ppm

Method:

Type of population: other: volunteers
Number of subjects exposed: 2 (sensory response)
Age: 24-47 years
Subjects: blind to inhaled concentration
Ethical approval: no data

Route of exposure: inhalation
Reason of exposure: intentional
Exposure assessment: measured
Details on exposure: Analysed by gas chromatography in the sensory response test. Exposure was in a glass-lined 12800 L room from which the vapour-air mixture was exhausted at 2500-3200 L/min.

Clinical signs: Human sensory response test: During the 30-min exposure to 1 ppm, one subject experienced slight eye and throat irritation at 7 min and one subject reported olfactory fatigue after 24 min.
No olfactory fatigue was reported by either subject during the 30-min exposure to 5.5 ppm dicyclopentadiene vapour. Eye irritation was reported by one subject after 10 min at this concentration. One subject could taste dicyclopentadiene for 1 hr after the 5.5 ppm exposure.

Results of examinations: During the 30-min exposure to 1 ppm, one subject experienced slight eye and throat irritation at 7 min and one subject reported olfactory fatigue after 24 min. No olfactory fatigue was reported by either subject during the 30-min exposure to 5.5 ppm dicyclopentadiene vapour. Eye irritation was reported by one subject after 10 min at this concentration. One subject could taste dicyclopentadiene for 1 hr after the 5.5 ppm exposure.

Reliability: 2 (reliable with restrictions).

Study 2

Data source: HSDB: DICYCLOPENTADIENE - Human Health Effects: Skin, Eye and Respiratory Irritations
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001)., p. 2:38

Detailed study summary and results:

Dicyclopentadiene causes mild to severe eye, skin, and respiratory tract irritation, and severe response of the eyes and skin result from 24-hour exposure.

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Study 3

Data source: HSDB: DICYCLOPENTADIENE - Human Health Effects: Skin, Eye and Respiratory Irritations
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

American Conference of Governmental Industrial Hygienists. Documentation of the TLV's and BEI's with Other World Wide Occupational Exposure Values. CD-ROM Cincinnati, OH 45240-1634 2005., p. 1

Detailed study summary and results:

... Eye and skin irritation from the undiluted material is relatively minor.

Reliability: this information is taken from a reliable peer reviewed database: HSDB.

Eye damage/eye irritation - other data

No data available.

3.4 Respiratory sensitisation

Respiratory sensitisation - animal data

No data available.

Respiratory sensitisation - human data

No data available.

Respiratory sensitisation - other data

No data available.

3.5 Skin sensitisation

Skin sensitisation - animal data

Study 1

Data source: ECHA website - Exp Key Skin sensitisation.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/5/2

Study reference:

Author not specified. Report date 1989-01-17.

Detailed study summary and results:

The sensitization potential of dicyclopentadiene 75% was investigated in female guinea pigs in a modified (9 -induction) Buehler test. The animals were dermally exposed to 0.5 mL undiluted dicyclopentadiene 75% for each of 9 induction phases. Scattered mild redness was commonly seen at the induction sites during the induction phase. Other adverse skin reactions were fissuring, dry, thickened, straw-coloured skin (possible hyperkeratinisation), loss of skin suppleness, superficial cracking of the skin and small superficial scattered scabs. These reactions sometimes precluded evaluation of erythema. Following challenge with 0.2 mL undiluted dicyclopentadiene 75%, no skin responses were noted in test or control animals at 24 or 48 hours after challenge. It is concluded that dicyclopentadiene 75% was a non-sensitiser to guinea pig skin.

Test type:

Type of method: in vivo
Type of study: other: Modified Buehler test
Test guideline: according to OECD Guideline 406 (Skin Sensitisation)
GLP compliance: yes

Test substance

Name of test material (as cited in study report): DCPD 75%
CAS number: 77-73-6
Physical state: clear, yellow coloured liquid
Composition of test material, percentage of components: endo dicyclopentadiene: 71.1, exo dicyclopentadiene: 0.8, m-bicyclozonadiene: 1.4, CPD-MCPD codimers: 15.2, tricyclopentadiene: 0.3, CPD-butadiene codimer: 1.3, CPD-piperylene codimer: 0.3, CPD-isoprene codimer: 0.3, benzene: <0.1, misc.hydrocarbons: balance.
Lot/batch No.: PD Sample 1
Stability: Not determined
Specific gravity (15/15°C) 0.9811
Other: Gardner colour: 4+; total sulfur: 60 ppm (w/w); flashpoint 39°C pct (w/w)

Test animals:

Species: guinea pig
Strain: Dunkin-Hartley
Sex: female

TEST ANIMALS
Source: David Hall Ltd., Burton-on-Trent, Staffordshire, UK
Age at study initiation: 7-10 weeks
Weight at study initiation: 320-395 g
Housing: In groups of up to 4, in solid-floor polypropylene cages with softwood shavings
Diet: Guinea Pig FD1 Diet ad libitum, Special Diet Services Ltd., Witham, Essex, UK
Water: Mains water ad libitum
Acclimation period: At least 5 days

ENVIRONMENTAL CONDITIONS
Temperature: 18-21°C
Humidity: 60-68%
Air changes (per hr): Approximately 15/hour
Photoperiod: 12 hrs dark / 12 hrs light

IN-LIFE DATES: From: 13 September 1988 To: 19 October 1988

Administration/exposure:

Test system: Traditional sensitisation test
Route of induction exposure: epicutaneous, occlusive
Route of challenge exposure: epicutaneous, occlusive
Vehicle: unchanged (no vehicle)
Concentration: Undiluted for both induction and challenge.
No. of animals per dose: 12
RANGE FINDING TESTS: Yes

- Groups of at least 2 animals were used and up to four different concentrations of the test substance were tested on each animal.

MAIN STUDY
A. INDUCTION EXPOSURE
No. of exposures: 9
Exposure period: 6 hours
Test groups: yes
Control group: yes
Site: an area on the shoulder
Frequency of applications: on days 0, 2, 4, 7, 9, 11, 14 16 and 18
Concentrations: 0.5 mL of undiluted test material

B. CHALLENGE EXPOSURE
No. of exposures: 1
Day(s) of challenge: 10
Exposure period: 6 hours
Test groups: yes
Control group: yes
Site: an area of flank
Concentrations: 0.2 mL of undiluted test material
Evaluation (hr after challenge): Approximately 24 and 48 hours after patch removal

Results and discussion:

Results of test:
Reading: 1st reading
Hours after challenge: 24
Group: test group
Dose level: undiluted test material
No. with + reactions: 0
Total no. in group: 12

Reading: 2nd reading
Hours after challenge: 48
Group: test group
Dose level: undiluted test material
No. with + reactions: 0
Total no. in group: 12

Reading: 1st reading
Hours after challenge: 24
Group: negative control
Dose level: blank patch
No. with + reactions: 0
Total no. in group: 12

Reading: 2nd reading
Hours after challenge: 48
Group: negative control
Dose level: blank patch
No. with + reactions: 0
Total no. in group: 12

Any other information on results incl. tables:
Scattered mild redness was commonly seen at the induction sites during the induction phase. Other adverse skin reactions were fissuring, dry, thickened, straw-coloured skin (possible hyperkeratinisation), loss of skin suppleness, superficial cracking of the skin and small superficial scattered scabs. These reactions sometimes precluded evaluation of erythema.
No signs of skin irritation were noted in control animals during induction.
No skin responses were noted in test or control animals at 24 or 48 hours after challenge.

Conclusions: In a modified (9 induction) Beuhler test in female guinea pigs , there were no skin responses following challenge with undiluted dicyclopentadiene 75%w. Dicyclopentadiene 75% is therefore considered to be non-sensitising to guinea pig skin.

Reliability: 1 (reliable without restriction)

Study 2

Data source: ECHA website - Exp Supporting Skin sensitisation.001
Link:http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/5/2/?documentUUID=5bd34769-c2e1-44dc-a67a-5433aeba6af1

Study reference:

Author not specified. Report date 1976-06-24.

Detailed study summary and results:

In a sensitisation study, guinea pigs were induced with 10 intracutaneous injections of 0.1 mL 0.1% w/v dicyclopentadiene over a 3 week period. Two weeks later they were challenged with another intracutaneous injection of 0.1 mL 0.1% w/v dicyclopentadiene. Local skin reactions were assessed according to the Draize scheme. Only mild erythema was seen at 24 and 48 hours after challenge and dicyclopentadiene is therefore considered to be non-sensitising to guinea pigs. The positive controls showed a marked skin reaction to challenge with 2,4 -DNCB.

Test type:

Type of method: in vivo
Type of study: Draize test
Test guideline: no guideline available
GLP compliance: no data

Test substance

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: waxy solid, liquefied on slight warming
Analytical purity: 98-99% pure
Impurities (identity and concentrations): Trace - one may be the cis-form
Lot/batch No.: LBI No. 763A

Test animals:

Species: guinea pig
Strain: no data
Sex: no data

TEST ANIMALS
Source: Charles River Breeding Laboratories Inc., Wilmington, Massachusetts, USA
Housing: Individually housed
Diet: ad libitum
Water: ad libitum
Acclimation period: no data

ENVIRONMENTAL CONDITIONS
No data

Administration/exposure:

Test system: Traditional sensitisation test
Route of induction exposure: other: intracutaneous injection
Route of challenge exposure: other: intracutaneous injection
Vehicle: corn oil
Concentration: 0.1 % w/v
No. of animals per dose: 8

Details on study design (Traditional tests):
MAIN STUDY
A. INDUCTION EXPOSURE
- No. of exposures: 10
- Exposure period: 3 weeks
- Test groups: dicyclopentadiene in corn oil
- Control group: 2,4,Dintro-1-chlorobenzene in physiological saline (positive control)
- Site: trunk area
- Frequency of applications: 3/week
- Concentrations: 0.1 % w/v
- Dose volume: 0.05 mL (1st injection), 0.1 mL thereafter.

B. CHALLENGE EXPOSURE
- No. of exposures: 1
- Day(s) of challenge: 2 weeks after last induction dose
- Exposure period: single challenge dose
- Test groups: dicyclopentadiene in corn oil
- Control group: 2,4,Dintro-1-chlorobenzene in physiological saline (positive control)
- Site: trunk area
- Concentrations: 0.1 % w/v
- Evaluation (hr after challenge): 24 & 48 hr

OTHER: The control vehicle was injected in to the opposite side of the trunk at all induction time points for treated and positive control animals.

Positive control substance(s): yes 2,4-dinitrobenzene

Results and discussion:

Positive control results: Number of animals with a positive response not clearly stated; 'In all cases' has been interpreted as all 4 animals with a positive response

Traditional sensitisation test:
Results of test:
Reading: 1st reading
Hours after challenge: 24
Group: test group
Dose level: 0.1% w/v
No. with + reactions: 0
Total no. in group: 8
Clinical observations: mild erythema

Reading: 2nd reading
Hours after challenge: 48
Group: test group
Dose level: 0.1% w/v
No. with + reactions: 0
Total no. in group: 8
Clinical observations: mild erythema

Reading: 1st reading
Hours after challenge: 24
Group: positive control
Dose level: 2,4-DNCB
No. with + reactions: 4
Total no. in group: 4
Clinical observations: marked skin reactions

Reading: 2nd reading
Hours after challenge: 24
Group: positive control
Dose level: 2,4-DNCB
No. with + reactions: 4
Total no. in group: 4
Clinical observations: marked skin reactions

Conclusions: In a sensitisation study in guinea pigs, 0.1% dicyclopentadiene was shown to be non-sensitising following intracutaneous challenge.

Reliability: 2 (reliable with restrictions).

Skin sensitisation - human data

No data available.

Skin sensitisation - other data

No data available.

3.6 Germ cell mutagenicity

Germ cell mutagenicity - animal data

Study 1
Data source: ECHA website – Genetic toxicity: in vivo
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/7/3

Study reference:

Author not specified. Report date 2004-07-25.

Detailed study summary and results:

DCPD/Codimer Concentrate did not induce a statistically significant increase in micronucleated polychromatic erythrocytes in male or female mouse bone marrow when evaluated after two administrations, approximately 24 hours apart. The highest dose administered on the study (1750 mg/kg body weight) gave clear evidence of clinical signs (both sexes) and bone marrow toxicity (decreased PCE/NCE ratio) in females. Based on these findings, the test substance was considered negative in this in vivo assay.

Test type:

Type of genotoxicity: chromosome aberration
Type of study: micronucleus assay

Test guideline: according to OECD Guideline 474 (Mammalian Erythrocyte Micronucleus Test)
Deviations: no

Test guideline: according to EPA OPPTS 870.5395 (In Vivo Mammalian Cytogenics Tests: Erythrocyte Micronucleus Assay)
Deviations: no

Test guideline: according to EU Method B.12 (Mutagenicity - In Vivo Mammalian Erythrocyte Micronucleus Test)
Deviations: no

GLP compliance: yes

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene/Codimer Concentrate
Synonyms: DCPD/Codimer Concentrate, DCP97, H-25430
CAS number: 68478-10-4
CA Index name: Naphtha (petroleum), light steam-cracked, debenzenized, C8-16-cycloalkadiene concentrate
Lot number: 121302
Substance type: a distillate from a C8+ fraction of thermally processed pyrolysis gasoline obtained from ethylene production
Physical state: colourless liquid
Purity: Not applicable (the test substance was within specifications and the occurrence and distribution of isomers was as expected)

Stability under test conditions: stable at room temperature below 70°F, protected from light and air
Composition of test material, percentage of components:
29.175 wt % endo- and exo-DCPD
18.726 wt % C4-MCPD and C5-MCPD codimers
13.210 wt % MCPD dimer
12.903 wt % CPD-MCPD codimer
8.129 wt % C8 aliphatic and aromatic hydrocarbons
7.144 wt % C4-CPD and C5-CPD codimers
3.625 wt % MCPD-C7 dimer
2.771 wt % Tetrahydroindene
1.917 wt % Trimers
0.927 wt % C7 cyclic hydrocarbon
0.697 wt % C5 acyclic hydrocarbon dimer
0.634 wt % MCPD monomer
0.078 wt % CPD monomer
0.063 wt % C6 acyclic hydrocarbons

Test animals:

Species: mouse
Strain: other: Crl:CD-1®(ICR)BR
Sex: male/female

Source: Charles River Breeding Laboratories, Raleigh, North Carolina, USA (males); Charles River Canada, St. Constant, Canada (females)
Age at study initiation: approximately 8 weeks
Weight at study initiation: approximately 28.7-35.6 g (males), 21.6-26.8 g (females)
Assigned to test groups randomly: yes (by computerised stratified randomisation)
Fasting period before study: No
Housing: 3 same sex per cage in stainless steel, wire-mesh suspended cages.
Diet: Certified Rodent LabDiet® 5002 (PMI Nutrition International, Inc.,) ad libitum
Water: tap water ad libitum
Acclimation period: 6 days

ENVIRONMENTAL CONDITIONS
Temperature: 22±3ºC
Humidity: 30-70%
Air changes (per hr): Not reported
Photoperiod: 12 hrs dark / 12 hrs light

IN-LIFE DATES: Not reported

Administration/exposure:

Route of administration: oral: gavage
Vehicle(s)/solvent(s) used: corn oil
PREPARATION OF DOSING SOLUTIONS:
The dosing solutions were prepared daily in corn oil
A correction factor was not used for preparation of the dosing solutions
Prior to dosing, aliquots were taken from each DCPD/Codimer Concentrate dosing preparation, and the homogeneity/concentration and stability of the vehicle control, high, intermediate, and low test substance dosing preparations were confirmed

Duration of treatment / exposure: Two doses at an approximate 24-hour interval
Frequency of treatment: Twice at an approximate 24-hour interval
Post exposure period: 24 hours after second dose
Doses / concentrations: 0, 437.5, 875, or 1750 mg/kg body weight
Basis: other: nominal in corn oil
No. of animals per sex per dose: 5/sex/group (0, 437.5, or 875 mg/kg body weight and positive controls), 7/sex/group (1750 mg/kg body weight).
Control animals: yes, concurrent vehicle
Positive control(s): 5/sex (cyclophosphamide, 30 mg/kg once by oral intubation)
Tissues and cell types examined: Bone marrow erythrocytes
Details of tissue and slide preparation: The mice were killed approximately 24 hours after administration of the second dose and smears of bone marrow erythrocytes were prepared and stained.
Evaluation criteria: 2000 PCEs per animal were scored for the presence of micronuclei. The proportion of PCEs among 1000 total erythrocytes was determined for each animal and expressed as the PCE/NCE ratio.
Statistics: Total polychromatic erythrocytes (PCEs), micronucleated polychromatic erythrocytes, normochromatic erythrocytes (NCEs) were compared to the control using Dunnett's and Dunn's test ($p < 0.05$).

Results and discussion:

Test results:
Sex: male/female
Genotoxicity: negative
Toxicity: yes
Vehicle controls valid: yes
Positive controls valid: yes

Clinical signs observed in male and female animals at 1750 mg/kg included ataxia, lethargy, and hyperactivity. In addition, male animals exhibited spasms, and female animals exhibited ruffled fur, prostration, and hyperreactivity. No clinical signs of toxicity were observed in male or female animals at 875 or 427.5 mg/kg.
An 18% and 14% decrease in terminal body weight was observed for the high dose males and females, respectively, as compared with their initial body weights The terminal body weight loss for the high dose groups, as compared with the controls, was 18% for males and 13% for females. Both observed body weight reductions are considered test substance-related signs of systemic toxicity. The body weight loss in males is also considered biologically significant.
No statistically significant or biologically relevant effects on micronuclei frequencies were observed in the bone marrow cells in any dose group treated with DCPD/Codimer Concentrate. Although not statistically significant, a depression of approximately 30% in the PCE/NCE ratio was seen at 1750 mg/kg in females
The vehicle and positive control groups exhibited a response consistent with the laboratory's historical control data. The positive control, cyclophosphamide, induced a significant increase in the frequency of micronucleated PCEs ($p < 0.05$).

Conclusions: DCPD/Codimer Concentrate was considered negative in this in vivo assay.

Reliability: 1 (reliable without restriction)

Germ cell mutagenicity - human data

No data available.

Germ cell mutagenicity - in vitro data

Study 1

Data source: ECHA website - Exp Key Genetic toxicity in vitro.004
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/7/2/?documentUUID=1cf72af9-caed-431d-8d61-01b3c43be704

Study reference:

Study report 2014. Author not specified.

Detailed study summary and results:

DCPD has been tested for gene mutation in mammalian cells, using L5178Y mouse lymphoma cells and assessing mutant frequency at the TK+/- locus. The application of the test substance was limited by a steep toxicity dose-response curve. The test substance did not cause a statistically significant or dose-related incerase in mutant frequency either in the absence or presence of PB/BNF S9, following incubation for 4 hours (24 hours in one experiment in the absence of S9). The positive control substances (EMS and CP) gave the expected increases in mutation frequency.

In conclusion, DCPD does not cause gene mutation in mammalian cells in vitro, either without or with metabolic activation, under the conditions of this test.

Materials and methods:

Test type:

Type of genotoxicity: gene mutation
Type of study: mammalian cell gene mutation assay

Test guideline: according to OECD Guideline 476 (In vitro Mammalian Cell Gene Mutation Test)
Deviations: no

Test guideline: according to EU Method B.17 (Mutagenicity - In Vitro Mammalian Cell Gene Mutation Test)
Deviations: no

Test guideline: according to EPA OTS 798.5300 (Detection of Gene Mutations in Somatic Cells in Culture)
Deviations: no

GLP compliance: yes

Exception: no analysis was done on homegeneity, concentration, or satbility of the test substance formulation. The test item was formulated within 2 hours of it being applied to the test system and it was assumed to be stable for this duration.

Test substance

Identity of test material same as for substance defined in table 5 C&L report (if not read-across): yes
Test material form: clear colourless liquid
Analytical purity: approximately 95%

Description of test design:

Species/strain/ cell line: mouse lymphoma L5178Y cells
Metabolic activation: with and without
Metabolic activation system: PB/BNF S9 fraction prepared in-house from the livers of male Sprague-Dawley rats following three consecutive daily doses of phenobarbital/ß-naphthoflavone (80/100 mg/kg bw/day). The S9 was sored in a liquid nitrogen freezer at approximately -196°C.
Test concentrations:
0, 5.16, 10.31, 20.63, 41.25, 82.5, 165, 330, 660, 1320 µg/mL (initial toxicity test)
10, 15, 20, 25, 30, 35 µg/mL (expt 1: 4h -S9)
10, 20, 30, 40, 50, 60 µg/mL (expt 1: 4h +S9)
5, 10, 20, 30, 40, 50 µg/mL (expt 2: 24h -S9)
10, 20, 30, 40, 45, 50 µg/mL (expt 2: 4h +S9)
Vehicle: DMSO

Controls:
Negative controls: no
Solvent / vehicle controls: yes
True negative controls: no
Positive controls: yes
Positive control substance: cyclophosphamide, ethylmethanesulphonate
Remarks: positive controls were formulated in DMSO

METHOD OF APPLICATION: in medium
DURATION
- Preincubation period: none
- Exposure duration: 4 hours (24 hours in experiment 2 in the absence of S9)
- Expression time (cells in growth medium): 2 days
- Selection time (if incubation with a selection agent): 10-14 days

SELECTION AGENT (mutation assays): 5-trifluorothymidine

NUMBER OF REPLICATIONS: 2

Evaluation criteria:

Majority of plates for viability or TFT resistance are analysable
Viability of solvent controls: 65-120%
Total suspension growth of the colvent control over 4h should be in the range 8-32.
In-house vehicle control MF in the range 50-170x10-6

Positive control chemicals should induce at least 3-5 fold increase in MF
The upper limit of cytotoxicity in the positive control and test substances should be the same
Highest concentration of test substance should be 10mM/5000µg/mL unless limited by cytoxicity or solubility.

Results and discussion:

Species/strain/cell line: mouse lymphoma L5178Y cells
Metabolic activation: with and without
Genotoxicity: negative
Cytotoxicity: yes
Vehicle controls valid: not applicable
Negative controls valid: yes
Positive controls valid: yes

In the preliminary cytotoxicity test there was marked reduction in relative suspension growth of the cells at concentrations of ca. 80µg/mL and above, and cloudiness was observed at and above 330µg/mL. The maximum dose levels in the subsequent mutagenicity experiments was therefore limited by test item-induced toxicity.

Two subsequent mutagencity experiments were undertaken.

There was evidence of marked toxicity following exposure to the test item in the absence and presence of S9. Near optimum levels of toxicity were achieved in the absence of S9, but not in the presence of S9, despite a narrow concenration selection, due to the steep toxicity curve. Adose elevl that exceeded the upper limit for toxicity was plated for viability and TFT resistance as sufficient cells were available.
The vehicle controls had MF that were considered acceptable for the L5178Y cell line at the TK +/- locus. Both positive controls induced marked increases in mutant frequency.
The test item did not induce any staisticaqlly significant or dose-related increases in the mutant frequncy, eith in the absence or presence of S9.

Reliability: 1 (reliable without restriction)

Study 2

Data source: ECHA website - Exp Supporting Genetic toxicity in vitro.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/7/2/?documentUUID=2c45e003-9274-44d7-8f5b-6ac997ce80da

Study reference:

Author not specified. Report (1980)

Detailed study summary and results:

DCPD (Lot Numbers 040667 and W-761226) did not demonstrate mutagenic activity in Salmonella typhimurium strains TA98, TA100, TA1535, TA1537 or TA1538, with or without rat liver activation.

Materials and methods:

Test type:

Type of genotoxicity: gene mutation
Type of study: bacterial reverse mutation assay (e.g. Ames test)
Test guideline: equivalent or similar to OECD Guideline 471 (Bacterial Reverse Mutation Assay)
Deviations: yes E.coli was not included in the test

GLP compliance: no data

Test substance

Name of test material (as cited in study report): dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: Colourless liquid
Analytical purity: 98-99%
Lot/batch Nos tested: 040667 and W-761226

Description of test design:

Species/strain: other: S. typhimurium, TA98, TA100, TA1535, TA1537, TA1538
Metabolic activation: with and without
Metabolic activation system: Aroclor induced rat liver S9

Non-activated: 0.001, 0.01, 0.1, 1.0 or 5.0 µL/plate
Activated: 0.001, 0.01, 0.1, 1.0, 5.0 or 10 µL/plate

Controls:
Vehicle(s)/solvent(s) used: DMSO
Negative controls: yes
Solvent / vehicle controls: yes
Positive controls: yes
Positive control substance: methylnitrosoguanidine, 2-nitrofluorene and quinacrine mustard
Remarks: without activation

Negative controls: yes
Solvent / vehicle controls: yes
Positive controls: yes
Positive control substance: 2-anthramine, 2-acetylaminofluorene and 8-aminoquinoline
Remarks: with activation

METHOD OF APPLICATION: plate test (overlay method)
Approximately 10^8 cells from an overnight culture of each indicator strain were added to separate test tubes containing 2.0 mL of molten agar supplemented with biotin and a trace of histidine.
For non-activation tests, at least four dose levels of the test compound were added to the contents of the appropriate tubes and poured over the surfaces of selective agar plates.
In activation tests, a minimum of four different concentrations of the test chemical were added to the appropriate tubes with cells.

Just prior to pouring, an aliquot of reaction mixture (0.5 mL containing the 9000 x g liver homogenate) was added to each of the activation overlay tubes, which were then mixed, and the contents poured over the surface of a minimal agar plate and allowed to solidify.

DURATION
The plates were incubated for 48 hours at 37°C, and scored for the number of colonies growing on each plate.

Positive and solvent controls using both directly active positive chemicals and those that require metabolic activation were run with each assay.

Results and discussion:

Species/strain: other: S. typhimurium, TA98, TA100, TA1535, TA1537, TA1538
Metabolic activation: with and without
Genotoxicity: negative
Cytotoxicity: yes toxic at 5 µL/plate
Negative controls valid: yes
Positive controls valid: yes

DCPD (Lot Numbers 040667 and W-761226) did not demonstrate mutagenic activity with or without rat liver activation.

Interpretation of results: negative with and without metabolic activation

Conclusion: DCPD did not demonstrate mutagenic activity with or without rat liver activation.

Reliability: 2 (reliable with restrictions)

Study 3

Data source: ECHA website - Exp Key Genetic toxicity in vitro.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/7/2/?documentUUID=8b2e05d1-490b-4391-8716-fbdc1497070e

Study reference:

Author not specified. Report date 2000-03-08.

Detailed study summary and results:

Dicyclopentadiene resin grade did not induce a dose-related or a two-fold, increase in the number of revertant (His+) colonies in any of the four tester strains (TA1535, TA1537, TA98 and TA100) nor in the number of revertant (Trp+) colonies in tester strain WP2uvrA both in the absence and presence of S9-metabolic activation. These results were confirmed in an independently repeated experiment.

Dicyclopentadiene resin grade is not mutagenic in the Salmonella typhimurium reverse mutation assay or in the Excherichia coli reverse mutation assay.

Materials and methods:

Test type:

Type of genotoxicity: gene mutation
Type of study: bacterial reverse mutation assay (e.g. Ames test)
Test guideline: according to OECD Guideline 471 (Bacterial Reverse Mutation Assay)
Deviations: no

Test guideline: according to EU Method B.13/14 (Mutagenicity - Reverse Mutation Test Using Bacteria)
Deviations: no

GLP compliance: yes

Test substance

Name of test material (as cited in study report): Dicyclopentadiene resin grade
CAS number: 77-73-6
Physical state: clear light yellow liquid
Analytical purity: 75%
Lot/batch No.: TNZ001
Expiration date of the lot/batch: 1 April 2000
Storage condition of test material: room temperature in dark

Description of test design:

Species/strain: S. typhimurium TA 1535, TA 1537, TA 98 and TA 100
Metabolic activation: with and without
Metabolic activation system: S9 from Arochlor 1254 induced rat liver

Species/strain: E. coli WP2 uvr A
Metabolic activation: with and without
Metabolic activation system: S9 from Arochlor 1254 induced rat liver

Test concentrations: Dose range 1-666 µg/plate
Vehicle(s)/solvent(s) used: ethanol

Controls:
Solvent / vehicle controls: yes ethanol
Positive controls: yes
Positive control substance: sodium azide, 9-aminoacridine, daunomycine, methylmethanesulfonate, 4-nitroquinoline N-oxide, 2 aminoanthracene

METHOD OF APPLICATION: preincubation
DURATION:
Preincubation period: 30 minutes
Exposure duration: 48 hours

NUMBER OF REPLICATIONS: 2

DETERMINATION OF CYTOTOXICITY
Method: observation of reduction of bacterial background lawn, reduction in revertant colonies

Evaluation criteria:
Negative (ie non-mutagenic) if:
a) total number of revertants in tester strain at any concentration is not > 2 x solvent control value for TA100 and 3 x solvent control value for TA1535, TA1537, TA98 and WP2uvrA +/- activation
b) Negative response should be repeatable in at least one independently repeated expt.
Positive (ie mutagenic) if:
a) it produces at least a 3-fold (TA1535, TA1537, TA98 and WP2uvrA) or 2-fold (TA100) dose-related increase in the number of revertants with respect to the number induced ny solvent control in TA100 +/- activation. However any mean plate count < 20 is considered to be not significant
b) Positive response should be repeatable in at least one independently repeated expt.

Results and discussion:

Species/strain: S. typhimurium TA 1535, TA 1537, TA 98 and TA 100
Metabolic activation: with and without
Genotoxicity: negative
Cytotoxicity: yes
Vehicle controls valid: yes
Positive controls valid: yes

Species/strain: E. coli WP2 uvr A
Metabolic activation: with and without
Genotoxicity: negative
Cytotoxicity: yes
Vehicle controls valid: yes
Positive controls valid: yes

Interpretation of results: negative with and without metabolic activation

Conclusion: Dicyclopentadiene resin grade is not mutagenic in the Salmonella typhimurium reverse mutation assay or in the Excherichia coli reverse mutation assay.

Reliability: 1 (reliable without restriction)

Study 4

(1) Data source: ECHA website - Exp Key Genetic toxicity in vitro.005
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/7/2/?documentUUID=4195eaf7-d263-4ecf-bcf2-205802e6414f

(2) Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 5.5 Genetic toxicity in vitro (B.) Non-bacterial test
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

(1) Reference 1: Information sheet (1998) &
Reference 2: Author not specified. Report date 1993-12-31

(2) MHW, Japan (1997)

Detailed study summary and results:

Dicyclopentadiene did not induce significant cytogenetic damage to mammalian cells in vitro under conditions of this assay. Although some marginal chromosome damage occurred at the highest –S9 dose after 24 hrs continuous exposure, the test material was confirmed to be negative for clastogenicity in an in vitro micronucleus assay.

Results: negative.

Materials and methods:

Test type:

Type of genotoxicity: chromosome aberration
Type of study: in vitro mammalian chromosome aberration test
Test guideline: according to JAPAN Guidelines for Screening Mutagenicity Testing Of Chemicals
GLP compliance: yes

Test substance

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Analytical purity: 95%

Description of test design:

Species/strain: other: Chinese hamster lung (CHL/IU) cells
Details on mammalian cell lines (if applicable)
no data
Type and identity of media: Culture is foetal calf serum (FCS) supplemented with 10% Eagle MEM using the medium
Metabolic activation: with and without
Metabolic activation system: Rat liver (strain not specified). Phenobarbital and 5,6-benzoflavone induced (Treatment not specified)

Test concentrations:
Continuous treatment:
First experiment: 24 and 48 hour continuous treatment (-S9): 0.0, 0.014, 0.029, 0.057 mg/mL
Second experiment: 24 hour continuous treatment (-S9): 0.0, 0.029, 0.043, 0.057 mg/mL
Short-term treatment:
(-S9): 0.0, 0.014, 0.029, 0.057 mg/mL
(+S9): 0.0, 0.03, 0.05, 0.10 mg/mL

Vehicle: Acetone

Controls:
Negative controls: no
Solvent / vehicle controls: yes, acetone
True negative controls: no
Positive controls: yes
Positive control substance: (-S9): 0.00005 mg/mL Mitomycin C, (+S9): 0.005 mg/mL cyclophosphamide
Remarks: doses not specified

METHOD OF APPLICATION:
The test material was incubated with CHL/IU cells in growth phase (2x10^4 cells/mL growth medium) for 24 hrs and 48 hrs continuous treatment without metabolic activation and for a shorter duration (6 hrs) with and without metabolic activation from rat liver S9, at 37°C in a 5% CO2 in air incubator.
In accordance to Japanese guidelines, the dose range was selected to produce 50% or greater inhibition of cell growth or mitosis at the maximum dose level.
Following short-term exposure, cultures containing S9 mix were washed and fresh medium added.
All cultures were treated with Colcemid® approximately 2 hrs prior to harvest to arrest dividing cells in metaphase.
Cells were fixed and slides stained with 3% Giemsa solution, a standard stain for metaphase chromosome spreads).
All slides, including positive and negative controls were coded before microscopic analysis and read "blind".

NUMBER OF REPLICATIONS: 2 cultures per dose level

NUMBER OF CELLS EVALUATED:
Japanese guidelines specify that 100 metaphase spreads should be counted and analyzed for structural aberrations (gaps, breaks, exchanges) and polyploids, and the percentage of cells with aberrations (with and without gaps) calculated.

Evaluation criteria:
Chromosome analysis was done according to the Environmental Mutagen Society of Japan, mammalian test (MMS) Session 1 and was based on the taxonomy of the gap or chromatid-type chromosomal pattern, cut and the presence/absence of abnormal ploidy structure.
The following were recorded: number of cells observed, number and type of structural abnormality, total number of cells for ploidy.

Statistics: Fischer's Exact test - frequency of cells with chromosomal abnormalities
Kastenbaum & Bowman method - micronucleus test

Results and discussion:

Species/strain/cell line: other: Chinese hamster lung (CHL/IU) cells
Metabolic activation: with and without
Genotoxicity: negative
Cytotoxicity: yes
Vehicle controls valid: yes
Positive controls valid: yes

Dicylcopentadiene did not induce structural chromosomal aberrations or polyploidy in CHL/IU cells up to a concentration causing more than 50% cell growth inhibition with or without metabolic activation. Structural chromosomal aberrations were marginally induced at the highest dose –S9, 0.057mg/mL, after 24 hr continuous exposure.

Interpretation of results: negative

Reliability: 2 (reliable with restrictions)

Study 5

Data source: ECHA website - Exp Supporting Genetic toxicity in vitro.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/7/2

Study reference:

Author not specified. Report (1980).

Detailed study summary and results:

DCPD (Lot Numbers 040667 and W-761226) did not demonstrate mutagenic activity in Saccharomyces cerevisiae (strain D4), with or without rat liver activation.

Materials and methods:

Test type:

Type of genotoxicity: gene mutation
Type of study: in vitro gene mutation assay in fungi
Test guideline: equivalent or similar to OECD Guideline 480 (Genetic Toxicology: Saccharomyces cerevisiae, Gene Mutation Assay)

GLP compliance: no data

Test substance

Name of test material (as cited in study report): dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: Colourless liquid
Analytical purity: 98-99%
Lot/batch Nos tested: 040667 and W-761226

Description of test design:

Species/strain/cell line: Saccharomyces cerevisiae
Metabolic activation: with and without
Metabolic activation system: Aroclor induced rat liver S9

Test concentrations:
Non-activated: 0.001, 0.01, 0.1, 1.0 or 5.0 µL/plate
Activated: 0.001, 0.01, 0.1, 1.0, 5.0 or 10 µL/plate

Vehicle(s)/solvent(s) used: DMSO

Controls:
Negative controls: yes
Solvent / vehicle controls: yes
Positive controls: yes
Positive control substance: methylnitrosoguanidine, 2-nitrofluorene and quinacrine mustard
Remarks: without activation

Negative controls: yes
Solvent / vehicle controls: yes
Positive controls: yes
Positive control substance: 2-anthramine, 2-acetylaminofluorene and 8-aminoquinoline
Remarks: with activation

METHOD OF APPLICATION: plate test (overlay method)
Approximately 10^8 cells from an overnight culture of each indicator strain were added to separate test tubes containing 2.0 mL of molten agar supplemented with biotin and a trace of histidine.
For non-activation tests, at least four dose levels of the test compound were added to the contents of the appropriate tubes and poured over the surfaces of selective agar plates.
In activation tests, a minimum of four different concentrations of the test chemical were added to the appropriate tubes with cells.
Just prior to pouring, an aliquot of reaction mixture (0.5 mL containing the 9000 x g liver homogenate) was added to each of the activation overlay tubes, which were then mixed, and the contents poured over the surface of a minimal agar plate and allowed to solidify.

DURATION
The plates were incubated for 48 hours at 37°C, and scored for the number of colonies growing on each plate.

Positive and solvent controls using both directly active positive chemicals and those that require metabolic activation were run with each assay.

Results and discussion:

Species/strain: Saccharomyces cerevisiae
Metabolic activation: with and without
Genotoxicity: negative
Cytotoxicity: yes, toxic at 5 µL/plate
Negative controls valid: yes
Positive controls valid: yes

DCPD (Lot Numbers 040667 and W-761226) did not demonstrate mutagenic activity with or without rat liver activation.

Interpretation of results: negative with and without metabolic activation

Conclusion: DCPD did not demonstrate mutagenic activity with or without rat liver activation.

Reliability: 2 (reliable with restrictions)

Study 6

Data source 1: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 5.5 Genetic toxicity in vitro (A.) Bacterial test
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Data source 2: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Excerpts /GENOTOXICITY/
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

1) USEPA Genetox Program (1988)
2) Zeiger E et al; Environ Mutagen 9: 1-110 (1987)

Detailed study summary and results:

Dicyclopentadiene was evaluated for mutagenicity in the Salmonella/microsome preincubation assay using a standard protocol approved by the National Toxicology Program. Dicyclopentadiene was tested at doses of 0, 3, 10, 33, 100, and 333 ug/plate in four Salmonella typhimurium strains (TA98, TA100, TA1535, and TA1537) in the presence and absence of Aroclor-induced rat or hamster liver S9. Dicyclopentadiene was negative in these tests and the highest ineffective dose level tested without clearing of the background lawn in any Salmonella tester strain was 100 ug/plate.

Materials and methods:

Test type:

Type of genotoxicity: Bacterial gene mutation assay
Type of study: no data
Test guideline: no data
GLP compliance: no data

Test substance

Name of test material (as cited in study report): dicyclopentadiene (DCPD)
CAS number: 77-73-6
Analytical purity: Unknown

Description of test design:

Species/strain: S. typhimurium TA98, TA100, TA1535, TA1537, TA1538
Metabolic activation: with and without
Metabolic activation system: no data

Test concentrations: no data
Vehicle(s)/solvent(s) used: no data

Controls: no data
METHOD OF APPLICATION: no data.

DURATION: no data.

Results and discussion:

Species/strain: S. typhimurium TA98, TA100, TA1535, TA1537, TA1538
Metabolic activation: with and without
Genotoxicity: negative
Cytotoxicity: no data
Negative controls valid: no data
Positive controls valid: no data

DCPD did not demonstrate mutagenic activity with or without metabolic activation.

Reliability: this information is taken from a reliable peer reviewed data source: OECD SIDS and HSDB

Study 7

Data source: CCRIS (Chemical Carcinogenesis Research Information System) – Dicyclopentadiene. Data type: Mutagenicity
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2

Study reference:

Japan Chemical Industry Ecology-Toxicology And Information Center, Japan; mutagenicity test data of existing chemical substances based on the toxicity investigation of the Industrial Safety And Health Law; 1996

Detailed study summary and results:

Results: negative.

Materials and methods:

Test type:

Method: preincubation

Test substance

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6

Description of test design:

Species/strain: other: Ames Salmonella typhimurium TA98, TA100, TA1535, TA1537, TA1538
Metabolic activation: with and without
Metabolic activation system: rat liver S-9, phenobarbital and beta-naphthoflavone

Species/strain: E. coli WP2UVRA
Metabolic activation: with and without
Metabolic activation system: rat liver S-9, phenobarbital and beta-naphthoflavone

Test concentrations: Dose range 1.56-400 µg/plate
Vehicle(s)/solvent(s) used: DMSO

Results and discussion:

Species/strain: other: Ames Salmonella typhimurium TA98, TA100, TA1535, TA1537, TA1538
Metabolic activation: with and without
Metabolic activation system: rat liver S-9, phenobarbital and beta-naphthoflavone
Genotoxicity: negative

Species/strain: E. coli WP2UVRA
Metabolic activation: with and without
Metabolic activation system: rat liver S-9, phenobarbital and beta-naphthoflavone
Genotoxicity: negative

Reliability: this information is taken from a reliable peer reviewed database: CCRIS

Germ cell mutagenicity - other data

No data available.

3.7 Carcinogenicity

Carcinogenicity - animal data

Study 1

Data source: ECHA website – NS NS Carcinogenicity.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/8/?documentUUID=8ea29ae7-ad97-49c6-b1bd-7a5ff3751490

Study reference:

Rosenblatt et al. (1975): NTIS Rep. No. AD-AO 30 428, J1-8.

Detailed study summary and results:

There were no any signs of carcinogenic properties of DCPD.

Test type:

Test guideline: Unknown
GLP compliance: no data

Test substance:

Test material identity:
CAS number: 77-73-6
EC number: 201-052-9
EC name: 3a,4,7,7a-tetrahydro-4,7-methanoindene

Test animals:

Species: rat
Strain: not specified
Sex: not specified
No. of animals per sex per dose: not specified

Administration/exposure:

Route of administration – intramuscular

Results and discussion:

There were no any signs of carcinogenic properties of DCPD.

Carcinogenicity - human data

No data available.

3.8 Reproductive toxicity

Reproductive toxicity - animal data

Study 1

Data source: ECHA website - Exp Key Toxicity to reproduction.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/9/2

Study reference:

Information sheet dated 1998-03-30 and study report dated 1993-12-31.

Detailed study summary and results:

Dicyclopentadiene induced systemic toxicity (suppression of body weight gain and decreased food consumption) in male and female rats at the 100 mg/kg/day dose level. No compound-related effects were seen on reproductive parameters such as mating index, fertility index, gestation length, number of corpora lutea or implantations, implantation index, gestation index, delivery index or parturition. However, two dams in the 100 mg/kg group had total litter loss during the lactation period. A low viability index and tendency to lower birth wt and body wt gain was observed in neonates in the highest dose group (100 mg/kg). No significant differences in number of offspring, live offspring at birth, sex ratio or live birth

index were found. No abnormal findings were observed in external features, clinical signs in offspring, or at necropsy of offspring.

Test type:

Test type: combined repeated dose toxicity study with reproduction/ developmental toxicity screening
Test guideline: according to OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): dicyclopentadiene
CAS number: 77-73-6
Analytical purity: 94.65%
Physical state: colourless liquid with a camphor-like odour
Lot/batch No.: D93028
Stability under test conditions: confirmed to be stable by the manufacturer for the study period
Storage condition of test material: room temperature

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female

TEST ANIMALS
- Source: Charles River Japan, Inc.
- Age at study initiation: 8 weeks
- Weight at study initiation: males 304-339 g, females 186-227 g
- Housing: individually, except during mating, in polycarbonate cages
- Diet: CRF-1 (Oriental Yeast Co) assumed ad libitum
- Water: ultraviolet irradiated water (assumed ad libitum)
- Acclimation period: 6 days

ENVIRONMENTAL CONDITIONS
- Temperature: 20-25°C
- Humidity: 40-70%
- Air changes: approximately 12 per hr
- Photoperiod: 12 hrs dark / 12 hrs light

IN-LIFE DATES: Not reported

Administration/exposure:

Route of administration: oral: gavage
Vehicle: olive oil
Details on exposure: PREPARATION OF DOSING SOLUTIONS: Test substance mixed with olive oil, dose rate 10mL/kg bodyweight

Description of test design:

Details on mating procedure:
- M/F ratio per cage: 1:1
- Length of cohabitation: up to 7 days
- Proof of pregnancy: vaginal plug referred to as day 0 of pregnancy
Analytical verification of doses or concentrations: yes
Details on analytical verification of doses or concentrations: Stability and achieved concentration of dosing preparations was confirmed prior to dosing
Duration of treatment / exposure: Males 44 days; Females from 14 days before mating through gestation and parturition until day 3 of lactation
Frequency of treatment: Once daily

Details on study schedule:
- Dose selection rationale: Based on the results obtained in a 10 day oral dosing preliminary study where doses of 0, 30, 100 and 300 mg/kg were administered.
- The test substance was administered to male and female rats daily by oral gavage from 2 weeks prior to mating and during mating (approx. 2 weeks).
- Male rats continue to be dosed until sacrifice of females after day 3 of lactation. Females continue to be dosed through gestation to day 3 of lactation.
- Females were sacrificed on day 4 of lactation and males on day 45 of the study.

Doses / concentrations: 0, 4, 20 or 100 mg/kg/day
Basis: nominal conc.
No. of animals per sex per dose: 10
Control animals: yes, concurrent vehicle
Further details on study design: Dose selection rationale: Based on the results obtained in a 10 day oral dosing preliminary study where doses of 0, 30, 100 and 300 mg/kg were administered.

Examinations:
Parental animals: Observations and examinations
CLINICAL OBSERVATIONS: Yes
- Time schedule: daily

BODY WEIGHT: Yes
- Time schedule for examinations: weekly

FOOD CONSUMPTION: Yes

FOOD EFFICIENCY: No

WATER CONSUMPTION: No

HAEMATOLOGY: Yes (males only)
- Time schedule for collection of blood: termination
- Anaesthetic used for blood collection: Yes (sodium thiopental)
- Animals fasted: Yes (assumed)
- How many animals: 10/group
- Parameters examined: red blood cell, white blood cell, platelets, haemoglobin, haematocrit, differential white cell count, reticulocyte, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration

CLINICAL CHEMISTRY: Yes (males only)
- Time schedule for collection of blood: termination
- Anaesthetic used for blood collection: Yes (sodium thiopental)
- Animals fasted: Yes (assumed)
- How many animals: 10/group
- Parameters examined: GOT, GPT, ALP, ¿-GTP, urea nitrogen, glucose, total cholesterol, triglycerides, creatinine, total bilirubin, total protein, albumin, A/G ratio, calcium, inorganic phosphorus, sodium, potassium, chloride

PREGNANCY DATA: number of pairs with successful mating, mating index (%), number of pregnant females, fertility index (%), pairing days until mating, number of females with live pups, gestation index (%), gestation length, number of corpora lutea, number of implantation sites, implantation index (%), delivery index (%),

Estrous cyclicity (Parental animals): yes
Sperm parameters (Parental animals): No
Litter observations: PARAMETERS EXAMINED
The following parameters were examined in offspring: number and sex of pups, stillbirths, live pups on day 0, live birth index (%), number of live pups on day 4, viability index on day 4 (%), bodyweight of pups on days0 and 4, bodyweight gain days 0-4

GROSS EXAMINATION OF PUPS: Yes (on day 4)

Postmortem examinations (Parental animals):
SACRIFICE
- Male animals: All surviving animals on day 45
- Maternal animals: Day 4 of lactation
GROSS PATHOLOGY: Yes
ORGAN WEIGHTS: Yes
- organs weighed: thymus, liver, kidneys, adrenals, testes, epididymes
HISTOPATHOLOGY: Yes (liver, kidney and adrenals all groups, other tissues controls and 100 mg/kg groups only)
- tissues examined: thymus, liver, kidneys, adrenals, testes, epididymes, brain, heart, spleen, ovaries

Postmortem examinations (Offspring): Gross examination on day 4
Statistics: Bartlett's test if uniformly distributed analysis of variance, Kruskal-Wallis if non-uniform for quantitative data. When significant differences found between groups, Dunnett-type test or Scheff test. Significance level of 5% or less.

Reproductive indices: mating index, fertility index, gestation index, implantation index
Offspring viability indices: delivery index, live birth index, viability index (day 4)

Results and discussion:

Effect levels:
Endpoint: NOAEL
Generation: F1
Sex: male/female
Effect level: 20 mg/kg bw/day (nominal)
Basis for effect level / Remarks: for systemic and reproductive toxicity

Results of examinations: parental animals:

Clinical signs (parental animals): yes
Body weight and food consumption (parental animals): yes
Reproductive function: estrous cycle (parental animals): not examined
Reproductive function: sperm measures (parental animals): not examined
Reproductive performance (parental animals): yes
Organ weights (parental animals): yes
Gross pathology (parental animals): no effects
Histopathology (parental animals): yes

Details on results (parental animals):
CLINICAL SIGNS AND MORTALITY (PARENTAL ANIMALS)
- Two females in the high dose (100 mg/kg) group died. In these decedents the following major observations were noted: lung congestion, enlargement of the adrenal gland, and bleeding of the gastric mucosa and thymus.

BODY WEIGHT AND FOOD CONSUMPTION (PARENTAL ANIMALS)
Males and surviving females showed slight suppression of body wt gain and decreased food consumption.

ORGAN WEIGHTS (PARENTAL ANIMALS)
- There were increased liver and kidney weights in male rats given 100 mg/kg.

REPRODUCTIVE PERFORMANCE (PARENTAL ANIMALS)
- Two females in the 100 mg/kg group lost 100% of their litters during lactation (days 1-4). [HPV Reviewer's note: It is likely that these are the females that died, but not specified in summary].

HISTOPATHOLOGY (PARENTAL ANIMALS)
- In male rats given 100 mg/kg, single cell necrosis in liver, and hyaline droplets and basophilic changes in tubular epithelium of kidneys was seen. Increase in fatty droplets in fascicular zone of adrenals was observed in both males and females in the 100 mg/kg group. Similar histopathological changes were seen in kidneys of 4, 20 mg/kg group male rats and in adrenals of 20 mg/kg group male rats.

OTHER FINDINGS (PARENTAL ANIMALS)
- Blood chemistry of high dose males showed increase in GOT and GPT; no test material related changes occurred in haematology parameters for any treatment group.

Results of examinations: offspring
Viability (offspring): yes
Clinical signs (offspring): no effects
Body weight (offspring): yes
Sexual maturation (offspring): not examined
Organ weights (offspring): not examined
Gross pathology (offspring): not examined
Histopathology (offspring): not examined
Detailes on result (offspring): A low viability index and tendency to lower birth wt and body wt gain was observed in neonates in the highest dose group (100 mg/kg), a dose level that was associated with reduced food consumption, reduced weight gain, and mortality (2/10) in females. No significant differences in number of offspring, live offspring at birth, sex ratio or live birth index were found. However, two dams in the 100 mg/kg group had total litter loss

during the lactation period. No abnormal findings were observed in external features, clinical signs in offspring, or at necropsy of offspring.

Conclusions: Dicyclopentadiene induced systemic toxicity in male and female rats at the 100 mg/kg/day dose level. No compound-related effects were seen on reproduction. Effects on neonates included low viability index, lower birth wt and body wt gain in the 100 mg/kg group but not at lower dose levels.

Reliability: 2 (reliable with restrictions)

Study 2

Data source 1: ECHA website - Exp Supporting Toxicity to reproduction.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/9/2/?documentUUID=dff0d905-0109-4a54-9eb8-c60c3f3c042b

Data source 2: ECETOC publication - Joint Assessment of Commodity Chemicals, Report No. 19 on Dicyclopentadiene. Brussels, Belgium July 1991 – 8.6.2 Reproduction
Link: http://members.ecetoc.org/Documents/Document/JACC%20019.pdf

Study reference:

Author not specified. Report date 1980.

Detailed study summary and results:

Dietary administration of DCPD at nominal concentrations of 80 and 750 ppm to three successive generations of male and female albino rats had no deleterious effects on reproductive performance or general condition of the animals, in comparison to performance of control rats maintained concurrently. However, DCPD was not devoid of reproductive or systemic effects at the 750 ppm dietary level. Mean food consumption at 20 weeks in the F1B parents was reduced in both sexes in a treatment-related manner, with statistical significance at the 750 ppm level. At 750 ppm, female fertility was reduced in the F2A and F2B generations, however, the differences from control were not statistically significant, and this may have been due to one male in the 750 ppm group that failed to sire litters in either mating. A treatment- related reduction in mean pup weight on PND 21 was noted in the F3B generation, with mean m/f pup weights of 49/48, 44/41, and 43/41* grams in the control, 80 and 750 ppm groups, respectively. No evidence of dose-related teratogenic effects was seen in pups of any generation.

Test type:

Test type: three-generation study
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 416 (Two-Generation Reproduction Toxicity Study)
Deviations: yes, three generation study
GLP compliance: no

Test substance:

EC name: 3a,4,7,7a-tetrahydro-4,7-methanoindene
Source: MC/B, 2909 Highland Ave., Norwood, Ohio 45212

Catalogue number: TX310
Analysis: Performed with a UC-W98 column. Retention time was 1.9 minutes. Trace impurities noted at approximately 1.5 minutes and 2.1 minutes. - Purity appeared to be 98 to 99%, consistent with the MC/B assay of 99.79%.

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female

TEST ANIMALS
- Source: Weanling albino rats [CRL:COB (SD) BR] were obtained from the Charles River Breeding Laboratories, Inc., Portage, Michigan, USA
- Acclimated to laboratory conditions for 11 days
- The rats were identified by ear tags and cage cards, and housed individually (except when mating) in shoe box cages on AB-SORB-DRI bedding
- Food and water were provided ad libitum
- No further details

Administration/exposure:

Route of administration: oral: feed
Details on exposure: DIET PREPARATION
- Rate of preparation of diet (frequency): fresh diets were prepared weekly
- Mixing appropriate amounts with (Type of food): the appropriate quantity of DCPD, dissolved in 300 mL of corn oil, was added to 10 kg of Purina Laboratory Chow meal and mixed for at least 15 minutes in a twin shell blender
- Control diet was mixed with corn oil in the same fashion

Description of test design:

Details on mating procedure:
- M/F ratio per cage: Each male caged with two females of its dose group
- Length of cohabitation: 2 weeks
- The females were allowed to litter
- One week after weaning the first litters, the parents were remated, each male with a different pair of females
Analytical verification of doses or concentrations: yes
Details on analytical verification of doses or concentrations: Because of the possible loss from the diet through volatility of dicyclopentadiene, samples of each week's dietary batch were analysed using gas-liquid chromatography.
Duration of treatment / exposure: For 7 weeks prior to mating of the F0 parents through to study termination.
Frequency of treatment: Continuous

Details on study schedule:
F0 rats were mated seven weeks after initiation of treated diet. Selected F1b pups were designated F1 parents and were approx. 100 days old when mated to produce the F2a litters and subsequently the F2b litters. Selected F2b pups were designated F2 parents and similarly used to produce the F3 a and b litters.

Doses / concentrations: 0, 80, 750 ppm

Basis: nominal in diet
Doses / concentrations: 0, 69.3 or 693 ppm
Basis: analytical conc.

No. of animals per sex per dose: 10 males, 20 females
Control animals: yes

Examinations:
Parental animals: Observations and examinations
CAGE SIDE OBSERVATIONS: Yes
- Time schedule: Daily observations were made of parent rats for mortality and general condition

BODY WEIGHT: Yes
- Time schedule for examinations: At 4 and at 8-9 weeks, and shortly before each mating, parent rats were weighed

FOOD CONSUMPTION AND COMPOUND INTAKE (if feeding study): At 4 and at 8-9 weeks, and shortly before each mating, the food consumption of parent rats was estimated.

Estrous cyclicity (Parental animals): No
Sperm parameters (Parental animals): No
Litter observations: PARAMETERS EXAMINED:
- Gross abnormalities of pups
- Numbers of live and dead pups, and their mean body weight by sex at birth
- Number per sex Day 4 of lactation
- Number per sex and body weights Day 21 of lactation (weaning)

STANDARDISATION OF LITTERS:
- At Day 4 each litter was reduced to eight total pups, four per sex if possible

Postmortem examinations (Parental animals): Gross necropsy of all adult animals.
Postmortem examinations (Offspring): At weaning, gross necropsies were performed on approximately one-third of the first litters from all three generations, and on one-third of the F3b litters.
Statistics: Student's t-test

Reproductive indices:
Male and female fertility; gestation index.
Newborn viability; pup viability (Days 0-4); lactation viability (days 4-21); sex ratio Day 0.

Results and discussion:

Effect levels:
Endpoint: NOAEL
Sex: male/female
Effect level: 750 ppm (nominal) > 80 - < 750 ppm (nominal)

Basis for effect level / Remarks: no treatment-related effects on parents or offspring Mean food consumption at 20 weeks in the F1B parents was reduced in both sexes in a treatment-related manner, with statistical significance at the 750 ppm level. At 750 ppm female fertility was reduced in the F2A and F2B generations, however, the differences from control were not statistically significant and this may have been due to one male in the 750 ppm group that

failed to sire litters in either mating. A treatment- related reduction in mean pup weight on PND 21 was noted in the F3B generation with mean m/f pup weights of 49/48, 44/41, and 43/41* grams in the control, 80 and 750 ppm groups, respectively.

Results of examinations: parental animals:
Clinical signs (parental animals): no effect
Body weight and food consumption (parental animals): no effects yes. Mean food consumption at 20 weeks in the F1B parents was reduced in both sexes in a treatment-related manner, with statistical significance at the 750 ppm level.
Test substance intake (parental animals): no data
Reproductive function: estrous cycle (parental animals): not examined
Reproductive function: sperm measures (parental animals): not examined
Reproductive performance (parental animals): no effects yes. At 750 ppm female fertility was reduced in the F2A and F2B generations, however, the differences from control were not statistically significant and this may have been due to one male in the 750 ppm group that failed to sire litters in either mating.
Organ weights (parental animals): no effects not examined
Gross pathology (parental animals): no effects
Histopathology (parental animals): not examined

Results of examinations: offspring
Viability (offspring): no effects
Clinical signs (offspring): no effects
Body weight (offspring): no effects yes. A treatment- related reduction in mean pup weight on PND 21 was noted in the F3B generation with mean m/f pup weights of 49/48, 44/41, and 43/41* grams in the control, 80 and 750 ppm groups, respectively.
Sexual maturation (offspring): not examined
Organ weights (offspring): not examined
Gross pathology (offspring): no effects
Histopathology (offspring): not examined

Conclusions: The NOAEL of dicyclopentadiene was considered to be 750 ppm between 80 - 750 ppm (69 - 693 ppm actual concentration).

Reliability: 2 (reliable with restrictions)

Study 3

Data source 1: ECHA website - Exp Supporting Toxicity to reproduction.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/9/2/?documentUUID=e0fcf2c4-73c3-4be5-a192-7887515781b6

Data source 2: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Excerpts - Developmental or Reproductive Toxicity
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Jamieson, H.M., Delaney, J.C., Wolfe, G.W. and Chapin, R.E. (1995) "Reproductive effects of dicyclopentadiene in S-D rats assessed by a continuous breeding protocol." The Toxicologist. 15:166. Abstract No. 880

Detailed study summary and results:

DCPD was administered by gavage in corn oil at dose levels of 10, 30, and 100 mg/kg to animals that were housed individually for one week and then cohabitated for 16 weeks (20 animals/sex/group). DCPD at 100 mg/kg produced lower pup weights, increased pup mortality, fewer pups born alive, and increased cumulative days to litter. In the 30 mg/kg group, only a slight (4%) reduction in the average female pup weight was observed. There were no reproductive effects observed in the 10 mg/kg group. Epididymal sperm density, percent motility, percent abnormal sperm, spermatids per milligram of testis, and total spermatids per testis were not affected by the administration of DCPD at dose levels employed in this study. There was decreased F2 pup weight in the 100 mg/kg group of the second generation. At the doses that yielded reproductive effects, parental animals exhibited effects on liver and kidney; hence the DCPD reproductive effects that were observed in this study were not considered to be selective.

Test type:

Test type: two-generation study
Test guideline: Reproductive Assessment by Continuous Breeding Protocol (NTP, 1989)
GLP compliance: yes

Test substance:

Name of test substance: Dicyclopentadiene
Source: no data available
Analitical purity: no data available

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female

TEST ANIMALS
- The rats were housed individually for one week and then cohabitated for 16 weeks (20 animals/sex/group)
- No further details

Administration/exposure:

Route of administration: oral: gavage
Details on exposure: DCPD was administered by gavage in corn oil at dose levels of 10, 30, and 100 mg/kg

Description of test design:

Details on mating procedure:
- Length of cohabitation: F0: 16 weeks (20 animals/sex/group)
F1: one week (within groups)
- The females were allowed to litter
- On PND (posntal day) 81 +/- 10, F1 animals were cohabitated within groups for one week and necropsied following delivery of the litter

Doses / concentrations: 10, 30, and 100 mg/kg

Results and discussion:

Endpoint: NOAEL
Generation: P
Sex: male
Effect level: < 10 mg/kg bw/day
Basis for effect level / Remarks: At necropsy, DCPD caused 2%, 7% and 17% increase in liver wts and 16%, 15% and 16% in kidney wts in males from the 10, 30 and 100 mg/kg/d groups, respectively.

Endpoint: NOAEL
Generation: F1/F2
Sex: male/female
Effect level: 10 mg/kg bw/day
Basis for effect level / Remarks: At 100 mg/kg/d there were 28% fewer F1 pups born live , 8% lower adjusted live F1 pup wts, higher F1 pup moratlity and decreased F1 pup survival. At 30 mg/kg/d there was a 4% decrease in female pup weight. The reproductive effects of DCPD on F2 pups were not greater than those observed in F1 pups.

Results of examinations: parental animals
Clinical signs (parental animals): no data
Body weight and food consumption (parental animals): no data
Test substance intake (parental animals): no data
Reproductive function: estrous cycle (parental animals): no data
Reproductive function: sperm measures (parental animals): no data
Reproductive performance (parental animals): yes. Effects were seen at 100 mg/kg in females: 28% fewer F1 pups born live; 8% lower F1 pup weights; higher F1 pup mortality; increased cumulative days to litter; and decreased F1 pup survival in the final litter
Organ weights (parental animals): yes. In F0 males, liver/kidney weights were increased by 2%/16%, 7%/15% and 17%/16% in the 10, 20 and 100 mg/kg groups, respectively. Increased liver and kidney weights were also reported in F1 parental rats.
Gross pathology (parental animals): no data
Histopathology (parental animals): yes. Increased incidence of clear cell foci in the livers of rats in the 30 and 100 mg/kg groups
Details on results (parental animals): The reproductive effects of DCPD were not in F2 than in F1 rats

Results of examinations: offspring
Viability (offspring): yes, at 100 mg/kg: higher F1 pup mortality and decreased F1 pup survival in the final litter
Clinical signs (offspring): no data
Body weight (offspring): yes, at 100 mg/kg: 8% lower F1 pup weights and 12% lower F2 pup weights
Sexual maturation (offspring): no data
Organ weights (offspring): no data
Gross pathology (offspring): no data
Histopathology (offspring): no data
Details on results (offspring): DCPD at 100 mg/kg was shown to produce effects such as reduced pup body weights, increased pup mortality and decreased pup survival in F1 litters. Effects seen in the F2 litters were not greater than those seen in F1.

DCPD was administered by gavage in corn oil at dose levels of 10, 30, and 100 mg/kg to animals that were housed individually for one week and then cohabitated for 16 weeks (20 animals/sex/group). Newborn litters were euthanized after evaluation on postnatal day (PND) 1. Litters born after Week 17 were reared until PND 21 and selected weanlings were administered the same dose levels as their respective parents. On PND 81 +/- 10, F1 animals were cohabitated within groups for one week and necropsied following delivery of the litters. Reproductive toxicity was observed in the 100 mg/kg group females: 28% fewer F1 pups born live, 8% lower adjusted live F1 pup weights, higher F1 pup mortality, increased cumulative days to litter, and decreased F1 pup survival in the final litter. At 30 mg/kg there was a 4% decrease in the female pup weight. At the crossover mating, pup weight was reduced (9%), in the DCP-treated females, while no effects were observed in litters from DCPD-treated males. At necropsy, DCPD caused a 2%, 7%, and 17% increase in liver weights and a 16%, 15%, and 16% increase in kidney weights in males from the 10, 30, and 100 mg/kg groups, respectively. Microscopically, an increase in the incidence of clear cell foci was observed in the livers of 30 and 100 mg/kg rats. In the second generation, DCPD at 100 mg/kg caused a 12% reduction in F2 pup weight in the presence of increased F1 liver and kidney weights. The reproductive effects of DCPD were not greater than those observed in the first generation. Thus, DCPD is a reproductive toxicant, but not selectively so, as there were systemic toxicities at and below reproductively toxic dose levels.

Reliability: this information is taken from a reliable peer reviewed data source: HSDB

Study 4

Data source: ECHA website - Exp Key Developmental toxicity/ teratogenicity.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/9/3/?documentUUID=0707b2af-aebd-4731-8570-bdf29aa38514

Study reference:

Author not specified. Report date 1978.

Detailed study summary and results:

Administration of DCPD by incorporation into the diet at 80, 250 and 750 ppm produced no effect on pregnant dams when fed on days 6-15 of gestation. There was no evidence of teratogenicity or developmental toxicity at this dose.

Test type:

Limit test: no
Test guideline: equivalent or similar to EPA OPP 83-3 (Prenatal Developmental Toxicity Study)
GLP compliance: no data

Test substance:

EC name: 3a,4,7,7a-tetrahydro-4,7-methanoindene
CAS number: 77-73-6
Source: MC/B, 2909 Highland Ave., Norwood, Ohio 45212, USA
Catalogue number: TX310

Analysis: Performed with a UC-W98 column. Retention time was 1.9 minutes. Trace impurities noted at approximately 1.5 minutes and 2.1 minutes. - Purity appeared to be 98 to 99%, consistent with the MC/B assay of 99.79%.

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: female

TEST ANIMALS
- Strain: CRL:COBS(SD)BR
- Source: Charles River Breeding Laboratories, Inc., Portage, Michigan, USA
- Age at start of treatment: 11 weeks
- Housing: Individually housed in wire cages
- Diet: Purina Laboratory Chow ad libitum
- Water: acidified pH 2.5 ad libitum
- Acclimation period: 12 days prior to pairing for mating

ENVIRONMENTAL CONDITIONS
- Temperature controlled: no data
- Humidity: no data
- Air changes (per hr): no data
- Photoperiod: 12 hrs dark / 12 hrs light

Administration/exposure:

Route of administration: oral: feed
Details on exposure: DIET PREPARATION
- Rate of preparation of diet (frequency): no data
- Mixing appropriate amounts with (Type of food): DCPD was suspended in 300 mL of corn oil and blended with 10 kg of the basal diet in a twin shell blender for 15 minutes
- The control diet contained 300 mL of corn oil per 10 kg of meal

Analytical verification of doses or concentrations: no data

Description of test design:

Details on mating procedure:
- Females were acclimated to laboratory conditions for 12 days and then paired with a sexually mature male of the same strain and from the same supplier
- Proof of pregnancy: Females were examined daily for the presence of a copulatory plug as evidence of mating, designated Day 0 of gestation
Duration of treatment / exposure: Days 6-15 of gestation
Frequency of treatment: Daily

Duration of test: Days 0-19 of gestation
Doses / concentrations: 0, 80, 250, 750 ppm
Basis: nominal in diet

No. of animals per sex per dose: 20 females
Control animals: yes

Examinations:
Maternal examinations:
CAGE SIDE OBSERVATIONS: Yes
- Time schedule: The mated female rats were observed daily for changes in general appearance, behaviour and condition

BODY WEIGHT: Yes
- Time schedule for examinations: The mated female rats were weighed on Days 0, 6, 16 and 19 of gestation

FOOD CONSUMPTION: Yes
- Food consumption was measured during the period 0-6, 6-16 and 16-19 days of gestation

POST-MORTEM EXAMINATIONS: Yes
- On Day 19 of gestation the female rats were necropsied

Ovaries and uterine content:
The ovaries and uterine content was examined after termination: Yes
- The number of implantation sites and their placement in the uterine horns, live and dead foetuses and resorption sites were recorded.

Fetal examinations:
- External examinations: Yes: The foetuses were removed, examined externally for abnormalities and weighed.
- Soft tissue examinations: Yes: One third of the foetuses of each litter were fixed in Bouin's fluid. These were later examined for changes in the soft tissues of the head, thoracic and visceral organs.
- Skeletal examinations: Yes: The remaining foetuses of each litter were examined for skeletal abnormalities following staining with Alizarin Red S.

Statistics: Statistical analysis of the data was performed using the litter as a basic sampling unit. Dunnett's t-test was used to determine statistical significance ($p<0.05$) with regard to difference between means with near normal distribution (maternal body weights and food consumption, mean pup weight based on litter averages). Ratios, e.g. sex ratio and pregnancy ratio, were analysed with a 2x2 contingency table with Yates' correction. With regard to discontinuous parameters as measured by the number of abnormal foetuses within a litter, Wilcoxon Rank Sum was used.

Results and discussion:

Effect levels:
Endpoint: NOAEL
Effect type: maternal toxicity
Effect level: 750 ppm (nominal)

Basis for effect level / Remarks: 60 mg/kg bw/d. Highest dose level tested.

Effect levels:
Endpoint: NOAEL
Effect type: developmental toxicity
Effect level: 750 ppm (nominal)

Basis for effect level / Remarks: 60 mg/kg bw/d. Highest dose level tested.

Maternal toxic effects: no effects
Embryotoxic / teratogenic effects: no effects
Any other information on results incl. tables: 750 ppm equivalent to 60 mg/kg/day based on a 250 g rat consuming 20 g diet/day.

Conclusions: The NOAEL for maternal and developmental toxicity was 750 ppm

Reliability: 2 (reliable with restrictions)

Study 5

Data source 1: ECHA website - Exp Supporting Developmental toxicity/ teratogenicity.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/9/3/?documentUUID=47043b7e-aa32-4844-b5b0-2d4e8c465b8a

Data source 2: US EPA Screening-level hazard characterization Document, December 2010 – Developmental toxicity
Link:http://www.epa.gov/chemrtk/hpvis/hazchar/Category_Resin%20Oils_December_2010.pdf

Data source 3: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Excerpts - Developmental or Reproductive Toxicity
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Author not specified. Report date 1993-08-11.

Detailed study summary and results:

Three of the 10 rabbits given 400 mg/kg/day and 1 given 300 mg/kg/day were found dead (days 21-23) in the post dosing period. In addition, 1 rabbit given 300 mg/kg/day and 1 given 100 mg/kg/day aborted on day 18. Maternal body weight loss during the treatment period was dose-related and statistically significant for the 200, 300 and 400 mg/kg/day groups. Decreased food and water consumption were observed in all animals given 300 or 400 mg/kg/day. The number of resorptions and non-live implants/litter were higher, and the number of foetuses lower, in the 400 mg/kg group compared to controls. Two litters from this group showed foetuses with abnormalities although the toxicological relevance of this is questionable given that 400 mg/kg/day is a lethal dose.

Test type:

Test guideline: no guideline followed
Deviations: not applicable dose range finding study for developmental toxicity
Principles of method if other than guideline: dose range finding study
GLP compliance: yes

Test substance:

EC name: 3a,4,7,7a-tetrahydro-4,7-methanoindene
CAS number: 77-73-6
Name of test material (as cited in study report): DCPD
Source: Aldrich Chemical Company

Analytical purity: 98%
Stability: Corn oil solution containing 10 mg/mL dicyclopentadiene was stable when stored for 30 days in sealed glass bottles at room temperature

Test animals:

Species: rabbit
Strain: New Zealand White
Sex: not specified

TEST ANIMALS
- Source: Hazleton Research Products, Inc. Denver, Pennsylvania, USA
- Status: Certified pasturella-free
- Age at study initiation: Young adults (approximately 22 weeks) time-mated at supplier on GD 0
- Weight at study initiation: GD 3, overall mean weight range 3374-3416 g
- Housing: Individual
- Diet: no data
- Water: no data
- Acclimation period: Not applicable; delivered GD 2

ENVIRONMENTAL CONDITIONS
- No data

IN-LIFE DATES:
- Mated on 25 October 1992

Administration/exposure:

Route of administration: oral: gavage
Vehicle: corn oil
Details on exposure: PREPARATION OF DOSING SOLUTIONS:
- The test chemical was formulated in corn oil on a weight to volume basis and administered via gavage at 1 mL/kg bw for all dose levels
- The control group received corn oil
- The dosage volume was adjusted based on bodyweight on gestation days 6, 8, 10, 12, 14, 16 and 18
Analytical verification of doses or concentrations: yes
Details on analytical verification of doses or concentrations: Gas chromatography. All concentrations found to be 98-104% of nominal.

Description of test design:

Details on mating procedure:
- purchased timed pregnant
- Proof of pregnancy: mated day 0 of gestation (GD0)
Duration of treatment / exposure: Days 6-19 of gestation
Frequency of treatment: Daily

Duration of test: 30 days
Doses / concentrations: 0, 25, 100, 200, 300 or 400 mg/kg/day
Basis: nominal conc.

No. of animals per sex per dose: 10
Control animals: yes, concurrent no treatment

Further details on study design: Dose selection rationale: Based on the reported LD50 for dicyclopentadiene in rats of 820 mg/kg. No rabbit data were available.

Examinations:
Maternal examinations:
CAGE SIDE OBSERVATIONS: Yes
- Time schedule: Twice daily

DETAILED CLINICAL OBSERVATIONS: No data

FOOD AND WATER CONSUMPTION: Yes
- No further details

BODY WEIGHT: Yes
- Time schedule for examinations: On gestational days 3, 6, 8, 10, 12, 14, 16, 18, 20, 25 and 30 (termination)

POST-MORTEM EXAMINATIONS: No data
- Killed on gestation day 30

Ovaries and uterine content:
The ovaries and uterine content was examined after termination: Yes
Examinations included:
- Gravid uterus weight: Yes
- Number of corpora lutea: No data
- Number of implantations: Yes
- Number of resorptions: Yes
- Number of live/dead foetuses: Yes

Fetal examinations:
- Number of live/dead foetuses: Yes
- Live litter weight: Yes
- External examinations: No
- Soft tissue examinations: No
- Skeletal examinations: No
- Head examinations: No

Statistics: Data analyzed using non-parametric statistical methods to identify dose response trends among treatment groups and differences between control and treatment groups. Kruskal-Wallis one-way analysis of variance used for all parameters except gestation day 3-30 body wts, gravid uterus wt and average foetal wts. Mann-Whitney Wilcoxan U test was used when Kruskal-Wallis was significant ($p<0.05$). Jonckheere's test for k independent samples was used for dose-response trends for gestation day 3 to day 30 body wt data. If no trend was found, Dunn's test was used for differences among dose groups; if a trend was present Shirley's test was applied. Body wt data collected after animals aborted were not included.
Body wts taken after abortions and developmental toxicity data from the 2 animals that aborted were not included in data analysis.

Results and discussion:

Effect levels:
Endpoint: NOAEL
Effect type: maternal toxicity
Effect level: 25 mg/kg bw/day (nominal)
Basis for effect level / Remarks: abortion in 1 dam at 100 mg/kg/day. The abortion of one litter in the 100 mg/kg/d group occurred in the absence of a statistically-significant reduction in maternal body weight, and no data for food consumption is provided in this DRF study. Consequently, it is uncertain if the abortion seen in one dam at 100 mg/kg was due to a direct effect of DCPD on the foetuses in this litter, or the consequence of maternal toxicity at 100 mg/kg.

Effect levels:
Endpoint: NOAEL
Effect type: developmental toxicity
Effect level: 300 mg/kg bw/day

Maternal toxic effects: yes
Details on maternal toxic effects: Three of the 10 rabbits given 400 mg/kg/day and 1 given 300 mg/kg/day were found dead (days 21-23) in the post dosing period. ~~In addition, 1 rabbit given 300 mg/kg/day aborted on day 18~~. In the 100 mg/kg/day group, one rabbit aborted on day 18; another had bloody vaginal discharge beginning on day 26 of gestation but was pregnant at scheduled necropsy. In the 300 mg/kg group, 1 rabbit had a bloody vaginal discharge beginning on day 19 of gestation, aborted 4 kits on day 21 with an additional 9 masses on gestational day 22. Three animals in the 400 mg/kg/day group had blood vaginal discharges; 2 recovered over several days, one was dead on gestation day 23. A dose-related decrease in maternal body weight was noted on gestation day 8, becoming statistically significant ($p<0.05$) from controls from day 10 through gestation day 18 for the 300 mg/kg group and day 8 to 30 for the 400 mg/kg group. Maternal wt gain during treatment was also statistically significantly decreased compared to controls in the 200 mg/kg/day and higher groups. Decreased food and water consumption were observed in all animals given 300 or 400 mg/kg/day beginning on gestation day 9.

Embryotoxic / teratogenic effects: yes
Details on embryotoxic / teratogenic effects: Developmental effects at the high-dose level included increased numbers of resorptions and non-live implants/litter and decreased number of foetuses. Two litters from does treated with 400 mg/kg-day showed gross deformities of kits; 1 with eyes open and 1 with eyes open and deformed hind limbs in 1 litter of 3 total live kits, and eyes open in all 12 kits from another high-dose litter. There were no other effects on gravid uterine weight, number of implantation sites, resorptions, dead fetuses and live fetuses in the other treated groups.

Conclusions: Dicyclopentadiene caused maternal lethality at 300 and 400 mg/kg/day, maternal toxicity at 200 mg/kg/day and possibly the abortion of 1 litter at 100 mg/kg. No developmental endpoints were affected by treatment at dose levels of 200 mg/kg/day or less although no foetal examination was conducted.

Reliability: 2 (reliable with restrictions)

Study 6

Data source: ECHA website - Exp Supporting Developmental toxicity/ teratogenicity.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/9/3/?documentUUID=e78f127b-fda6-46b3-a9bf-88ea9cbc7c24

Study reference:

Author not specified. Report date 1993-02-04.

Detailed study summary and results:

Dose levels of 200, 300, 400 and 500 mg/kg/day were lethal to pregnant rats when given from day 6 of gestation. Clinical signs included dried material around nose and mouth, rough hair coat, lethargy, hunched posture and ataxia. Maternal body weights were decreased in a dose-related manner. All animals given 50 mg/kg/day survived to termination of the study; maternal bodyweights were significantly lower than the controls during the treatment period. Only the control, 50 and 200 mg/kg/day groups had litters with live foetuses at necropsy on GD20. Foetal weight in the 200 mg/kg/day group was significantly decreased but there was no similar effect of 50 mg/kg/day. The mean number of live foetuses was unaffected by treatment.

Test type:

Limit test: no
Test guideline: no guideline followed
Deviations: not applicable
Remarks: dose range finding study for developmental toxicity
Principles of method if other than guideline: dose range finding study
GLP compliance: yes

Test substance:

EC name: 3a,4,7,7a-tetrahydro-4,7-methanoindene
CAS number: 77-73-6
Name of test material (as cited in study report): DCPD
Source: Aldrich Chemical Company
Analytical purity: 98%
Stability: Corn oil solution containing 10 mg/mL dicyclopentadiene was stable when stored for 30 days in sealed glass bottles at room temperature

Test animals:

Species: rat
Strain: other: Sprague Dawley CD(SD)BR
Sex: not specified

TEST ANIMALS
- Source: Charles River Breeding Laboratories, Raleigh, NC, USA
- Status: Certified viral antibody-free. Time-mated GD 0
- Age at study initiation: Young adults (approximately 77 days)

- Weight at study initiation: No individual data. GD 5, overall mean weight range 238.2-241.8 g
- Housing: Individual
- Diet: no data
- Water: no data
- Acclimation period: Not applicable; delivered GD 5

ENVIRONMENTAL CONDITIONS
- no data

IN-LIFE DATES:
- no data

Administration/exposure:

Route of administration: oral: gavage
Vehicle: corn oil
Details on exposure: PREPARATION OF DOSING SOLUTIONS:
- The test chemical was formulated in corn oil on a weight to volume basis and administered via gavage at 5 mL/kg bw for all dose levels
- The control group received corn oil
- The dosage volume was adjusted based on bodyweight on gestation days 6, 8, 10, 12, and 14
Analytical verification of doses or concentrations: yes
Details on analytical verification of doses or concentrations: Gas chromatography. All concentrations found to be at least 94.8% of nominal.

Description of test design:

Details on mating procedure:
- purchased timed pregnant
- Proof of pregnancy: mated day 0 of gestation (GD0)
Duration of treatment / exposure: Days 6-15 of gestation
Frequency of treatment: Daily

Duration of test: 20 days
Doses / concentrations: 0, 50, 200, 300, 400 or 500 mg/kg/day
Basis: nominal conc.

No. of animals per sex per dose: 11
Control animals: yes, concurrent no treatment

Further details on study design: Dose selection rationale: Dose selection rationale: Based on the reported LD50 for dicyclopentadiene in rats which ranged from 378-820 mg/kg.

Examinations:
Maternal examinations:
CAGE SIDE OBSERVATIONS: Yes
- Time schedule: Twice daily (once post-dosing)

DETAILED CLINICAL OBSERVATIONS: No data

BODY WEIGHT: Yes

- Time schedule for examinations: On gestational days 5, 6, 8, 10, 12, 14, 16 and 20 (termination)

POST-MORTEM EXAMINATIONS: No data
- Killed on gestation day 20

Ovaries and uterine content:
The ovaries and uterine content was examined after termination: Yes
Examinations included:
- Gravid uterus weight: Yes
- Number of corpora lutea: No data
- Number of implantations: Yes
- Number of resorptions: Yes
- Number of live/dead foetuses: Yes
- Live litter weight: Yes

Fetal examinations:
- External examinations: No
- Soft tissue examinations: No
- Skeletal examinations: No
- Head examinations: No

Statistics: Data analyzed using non-parametric statistical methods to identify dose response trends among treatment groups and differences between control and treatment groups. Kruskal-Wallis one-way analysis of variance used for all parameters except gestation day 5-20 body wts, gravid uterus wt and average foetal wts. Mann-Whitney Wilcoxan U test was used when Kruskal-Wallis was significant ($p<0.05$). Jonckheere's test for k independent samples was used for dose-response trends for gestation day 5 to day 20 body wt data. If no trend was found, Dunn's test was used for differences among dose groups; if a trend was present Shirley's test was applied. Body wt data from non-pregnant rats were not included.

Results and discussion:

Effect levels:
Endpoint: no NOAEL identified
Effect type: maternal toxicity
Effect level: < 50 mg/kg bw/day (nominal)

Basis for effect level / Remarks: reduced body weight at lowest dose tested.

Maternal toxic effects: yes
Details on maternal toxic effects: All animals in the 400 and 500 mg/kg groups were found dead by GD 9. Eight and 3 animals in the 300 and 200 mg/kg groups respectively, were found dead or were killed for humane reasons by GD 9. All animals in the 50 mg/kg/day group survived to scheduled termination. Signs of systemic toxicity were noted in all animals given 200 mg/kg/day group or more, from GD 7. Clinical signs included dried material around nose and mouth, rough hair coat, and lethargy increased in severity with increasing dose. Other signs included convulsions (1 rat given 200 mg/kg/day), hunched posture (6 rats given 300 mg/kg/day) and ataxia (5 rats given 300 mg/kg/day, 11 rats given 400 mg/kg/day and 9 rats given 500 mg/kg/day). Maternal body weights of the treated animals were decreased in a dose-related manner. These differences were statistically different ($p<0.05$) from the control group during the treatment period in the 50 mg/kg/day group and during the treatment and post-treatment period in the 200 mg/kg/day group.

Embryotoxic / teratogenic effects: yes
Details on embryotoxic / teratogenic effects: Only the control, 50 and 200 mg/kg/day groups had litters with live foetuses at scheduled necropsy on day 20. Average foetal weight in the 200 mg/kg/day group was significantly decreased ($p<0.05$) compared to the control group; the mean number of live foetuses was unaffected by treatment.

Summary of reproductive performance

	Dose Level (mg/kg/day)					
Number of females	0	50	200	300	400	500
Total	11	11	11	11	11	11
Died during study	0	0	3	8	11	11
Not pregnant	2	1	4	2	-	-
Total resorption	0	0	0	1	-	-
Litters with live foetuses	9	10	4	0	0	0

Conclusions: A NOAEL for maternal toxicity was not established in this study and is therefore, 50 mg/kg/day. However, this dose level was a NOAEL for developmental toxicity based on average foetal weight only. No foetal examination was included in this study.

Reliability: 2 (reliable with restrictions)

Reproductive toxicity - human data

No data available.

Reproductive toxicity - other data

No data available.

3.6 Specific target organ toxicity (single exposure)

Specific target organ toxicity (single exposure) - animal data

Study 1

Data source: ECHA website - Exp Key Acute toxicity: oral.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/2/?documentUUID=1d08558f-b67d-4956-819c-e785213588b2

Study reference:

Author not specified. Report date 1989-01-17

Detailed study summary and results:

Groups of 5 male and 5 female Sprague Dawley rats (fasted overnight) were dosed by gavage at levels of 500, 794, 1260 or 2000 mg/kg dicycolpentadiene and were observed

daily for 14 days after dosing. At the 4 hour observation period rats dosed with high levels of dicyclopentadiene (1260 or 2000 mg/kg bw) had hunched posture, piloerection, lethargy and decreased respiratory rate, with ptosis and occasional signs of ataxia seen in those dosed at 2000 mg/kg bw. All rats dosed at 1260 or 2000 mg/kg bw died one or two days after dosing. Haemorrhagic lungs, dark liver and sloughing of the non-glandular gastric epithelium was seen in decedents. The LD50 was calculated to be 590 mg/kg bw (male/female), 512 mg/kg (male) and 676 mg/kg/bw (female).

Test type:

Test type: standard acute method
Limit test: no
Test guideline: according to OECD Guideline 401 (Acute Oral Toxicity)
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): DCPD 75%
CAS number: 77-73-6
Physical state: clear, yellow-coloured liquid
Composition of test material, percentage of components: 71.1% endo dicyclopentadiene, 0.8% exo dicyclopentadiene, 1.4% m-bicyclozonadiene, 15.2% CPD-MCPD codimers, 0.3% tricyclopentadiene, 1.3% CPD-butadiene codimer, 0.3% CPD-piperylene codimer, 0.3% CPD-isoprene codimer, <0.1% benzene , remainder misc. hydrocarbons.
Specific gravity: 0.971
Storage condition of test material: room temperature

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female
Source: Interfauna (UK) Ltd., Wyton, Huntingdon, Cambridgeshire, UK
Age at study initiation: 5-8 weeks
Weight at study initiation: males 120-146 g; females 120-150 g
Fasting period before study: overnight
Housing: In groups of up to 5, sexes separately in solid floor polypropylene cages with sawdust bedding
Diet: Rat and Mouse Expanded Diet No. 1 (Special Diet Services Ltd., Witham, Essex, UK) ad libitum (except for overnight fast immediately prior to dosing and approximately 2 hours after dosing)
Water: Mains drinking water ad libitum
Acclimation period: At least 5 days

ENVIRONMENTAL CONDITIONS
Temperature: 20-21°C
Humidity: 45-68%
Air changes (per hr): approx 15
Photoperiod: 12 hrs dark / 12 hrs light

IN-LIFE DATES: From: 22 September 1988 To: 18 October 1988

Administration/exposure:

Route of administration: oral: gavage
Vehicle: unchanged (no vehicle)
Maximum dose volume applied: 2.06 mL/kg
Minimum dose volume applied: 0.51 mL/kg
Doses: 500, 794, 1260 and 2000 mg/kg bw
No. of animals per sex per dose: 5
Control animals: no
Duration of observation period following administration: 14 days
Frequency of observations and weighing: Observed 1 and 4 hours after dosing and once daily thereafter.
Body weights: recorded on day of dosing (day 0), days 7, 14 or at death.
Necropsy of survivors performed: yes
Statistics: The acute oral LD50 and 95% confidence limits calculated using the probit method.

Results and reliability:

LD50 (rat, male/female) = 590 mg/kg bw
95% CL = 393 886
LD50 (rat, male) = 512 mg/kg bw
95% CL = 227 1155
LD50 (rat, female) = 676 mg/kg bw
95% CL = 444 1030

Mortality: All deaths occurred one or two days following dosing. There were 2, 4, 5 and 5 male deaths and 1, 2, 5 and 5 female deaths in the 500, 794, 1260 and 2000 mg/kg bw groups respectively.

Clinical signs: Hunched posture, piloerection, lethargy and decreased respiratory rate were present in all animals during the day of dosing. Ptosis was occasionally noted in animals dosed with 794 or 1260 mg/kg during this period. All rats dosed with 2000 mg/kg had ptosis 1 and 4 hours after dosing with occasional signs of ataxia at the 4 hour observation. Vocalisation was noted in one rat dosed with 1260 mg/kg at the 4 hour observation. Red/brown staining around the snout was present in surviving animals treated with 500 or 794 mg/kg one day after dosing. All survivors appeared normal 2 days after dosing.

Body weight: All surviving animals showed expected body weight gain.

Gross pathology: Haemorrhagic lungs, dark liver and sloughing of the non-glandular gastric epithelium were seen in decedents. No abnormalities were seen in animals killed at the end of the study.

Reliability: 1 (reliable without restriction)

Study 2
Data source: ECHA website - Exp Supporting Acute Toxicity: oral.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/2

Study reference:

Author not specified. Report date 1976-06-24

Detailed study summary and results:

In an acute oral toxicity study in fasted Swiss Webster mice, gavage administration of dicyclopentadiene (in corn oil) at doses of between 167 and 600 mg/kg, caused signs of toxicity including decreased activity and prostration within 1-4 hours after dosing. Hyperaemia of the lungs, distension of the bladder, yellow fluid in the stomach and small intestines and black discolouration of areas of the liver and spleen were observed at necropsy in some animals that died during the study, but there were no gross abnormalities in mice which survived to the end of the study. The acute LD50 in fasted mice was calculated to be 220 mg/kg (male/female), 190 mg/kg (male) and 250 mg/kg (female).

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 401 (Acute Oral Toxicity)
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: waxy solid, liquefied on slight warning
Analytical purity: 98-99% pure DCPD
Impurities (identity and concentrations): Trace - one may be the cis-form.
Lot/batch No.: LBI No. 763A

Test animals:

Species: mice
Strain: Swiss Webster
Sex: male/female

Source: Camm Research, Wayne, New Jersey, USA
Age at study initiation: no data
Weight at study initiation: no data
Fasting period before study: overnight prior to dosing
Housing: in groups of 5 by sex in solid -bottom plastic cages
Diet: Purina Laboratory chow ad libitum except overnight prior to dosing
Water: ad libitum
Acclimation period: not reported

Administration/exposure:

Route of administration: oral: gavage
Vehicle: corn oil
Concentration in vehicle: 10% v/v

Justification for choice of vehicle: poor water solubility
Lot/batch no.: Mazola corn oil (no other details reported)
Doses: 167, 215, 278. 360. 464 and 600 mg/kg
No. of animals per sex per dose: 10
Control animals: no
Duration of observation period following administration: 14 days
Frequency of observations: Observations on day of dosing and daily thereafter.
Body weights: recorded on day of dosing and on days 7 and 14.
Necropsy of survivors performed: yes
Other examinations performed: clinical signs, body weight, gross pathology
Statistics: LD50 values and 95% confidence limits were calculated (Biometrics, Vol 12, pp 311, 1956)

Results and reliability:

LD50 (mouse, male/female) = 220 mg/kg bw
LD50 (mouse, male) = 190 mg/kg bw
95% CL = 125 289
LD50 (mouse, female) = 250 mg/kg bw
95% CL = 170 368

Mortality: see table below.

Table: Mortality following acute oral dose of dicyclopentadiene in mice
Males:

	Deaths on day:					
Dose (mg/kg)	1	2	3	4	5-14	Total mortality / total no. rmice
167	3	2	0	0	0	5/10
215	4	1	0	0	0	5/10
278	3	2	0	0	1	6/10
360	5	2	0	0	0	7/10
464	2	6	0	0	0	8/10
600	6	3	0	0	1	10/10

Females:

	Deaths on day:					
Dose (mg/kg)	1	2	3	4	5-14	Total mortality / total no.mice
167	0	0	0	0	0	0/10
215	3	3	0	0	0	610
278	2	1	0	0	0	3/10
360	2	7	0	0	0	9/10
464	3	2	0	0	0	5/10
600	4	5	0	0	0	9/10

Clinical signs: Decreased activity and prostration seen within 1-4 hours after dosing.

Gross pathology: Gross findings in animals which died during the study included yellow fluid in the stomach and small intestines, distension of the bladder with pinkish-orange fluid,

hyperaemia of the lungs and black discolouration of portions of the liver and spleen. There were no macroscopic abnormalities in animals that survived to the end of the study.

Reliability: 2 (reliable with restrictions)

Study 3

Data source: ECHA website - Exp Supporting Acute Toxicity: oral.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/2/?documentUUID=71539c8b-9b99-43a8-9d9a-54b72a715135

Study reference:

Author not specified. Report date 1976-06-24

Detailed study summary and results:

In an acute oral toxicity study in fasted Sprague Dawley rats, gavage administration of dicyclopentadiene (in corn oil) at doses of between 278 and 793 mg/kg, caused signs of toxicity including red stains around the mouth and nose, decreased activity, occasional ataxia and prostration 1-4 hours after dosing. Some instances of convulsions and tremors were reported but not all of these rats later died. Hyperaemia of the lungs was observed at necropsy in some animals that died during the study but there were no gross abnormalities in rats which survived to the end of the study. The acute LD50 in fasted rats was calculated to be 449 mg/kg (male/female), 520 mg/kg (male) and 378 mg/kg (female).

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 401 (Acute Oral Toxicity)
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: waxy solid, liquefied on slight warning
Analytical purity: 98-99% pure dicyclopentadiene
Impurities (identity and concentrations): Trace - one may be the cis-form.
Lot/batch No.: LBI No. 763A

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female

Source: ARS/Sprague Dawley, Madison, Wisconsin, USA
Age at study initiation: no data
Weight at study initiation: no data
Fasting period before study: overnight prior to dosing

Housing: individually in suspended wire cages
Diet: Purina Laboratory chow ad libitum except overnight prior to dosing
Water: ad libitum
Acclimation period: not reported

Administration/exposure:

Route of administration: oral: gavage
Vehicle: corn oil
Concentration in vehicle: 196 mg/mL
Justification for choice of vehicle: poor water solubility
Lot/batch no.: Mazola corn oil (no other details reported)
Doses: 278, 360, 464, 600 and 793 mg/kg
No. of animals per sex per dose: 10
Control animals: no
Duration of observation period following administration: 14 days
Frequency of observations: Observations on day of dosing and daily thereafter.
Body weights: recorded on day of dosing and on days 7 and 14.
Necropsy of survivors performed: yes
Other examinations performed: clinical signs, body weight, gross pathology
Statistics: LD50 values and 95% confidence limits were calculated (Biometrics, Vol 12, pp 311, 1956)

Results and reliability:

LD50 (rat, male/female) = 449 mg/kg bw
LD50 (rat, male) = 520 mg/kg bw
95% CL = 420 465
LD50 (rat, female) = 378 mg/kg bw
95% CL = 303 473

Mortality: see table below.

Table: Mortality in fasted rats following oral dose of dicyclopentadiene
Males:

	Deaths on day:					
Dose (mg/kg)	1	2	3	4	5-14	Total mortality / total no. rats
278	0	1	0	0	0	1/10
360	0	2	0	0	0	2/10
464	0	3	0	0	0	3/10
600	0	7	1	0	0	8/10
793	0	7	1	0	0	8/10

Females:

Dose (mg/kg)	Deaths on day: 1	2	3	4	5-14	Total mortality / total no. rats
278	0	0	0	0	0	0/10
360	0	5	0	0	0	5/10
464	0	7	0	0	0	7/10
600	0	9	0	0	0	9/10
793	0	10	0	0	0	10/10

Clinical signs: Red stains around the mouth and nose, decreased activity, occasional ataxia and prostration 1-4 hours after dosing. Some instances of convulsions and tremors were reported but not all of these rats later died.

Gross pathology: Of those rats that died during the study, hyperaemia of the lungs was present in some but most showed no abnormalities. At necropsy of surviving rats, there were no gross abnormalities.

Reliability: 2 (reliable with restrictions)

Study 4

Data source: ECHA website - Exp Key Acute toxicity: dermal.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/4

Study reference:

Author not specified. Report date 1989-01-17

Detailed study summary and results:

The acute dermal toxicity of dicyclopentadiene 75% was assessed in a group of 5 male and 5 female rats. 2.06 mL/kg body weight was applied to the shorn flank and held in place with an occlusive dressing. Animals were observed at 1 and 4 hours after dosing and then daily for 14 days. Clinical signs present on day 1 included vocalisation lasting up to 30 minutes (noted in all animals after dosing), hunched posture, lethargy, piloerection, erythema and oedema. Isolated incidences of red/brown staining of snout and ptosis were seen. All animals showed signs of eschar by day 3 which persisted until days 10 or 12. All treatment sites appeared normal by the end of study. All animals gained weight and there were no gross abnormalities at necropsy. The acute dermal LD50 of dicyclopentadiene 75% in the rat was greater than 2000 mg/kg body weight.

Test type:

Test type: standard acute method
Limit test: yes
Test guideline: according to OECD Guideline 402 (Acute Dermal Toxicity)
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): DCPD 75%
CAS number: 77-73-6
Physical state: clear, yellow-coloured liquid
Composition of test material, percentage of components: 71.1% endo dicyclopentadiene, 0.8% exo dicyclopentadiene, 1.4% m-bicyclozonadiene, 15.2% CPD-MCPD codimers, 0.3% tricyclopentadiene, 1.3% CPD-butadiene codimer, 0.3% CPD-piperylene codimer, 0.3% CPD-isoprene codimer<0.1% benzene , remainder misc. hydrocarbons.
Specific gravity: 0.971
Storage condition of test material: room temperature

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female
Source: Interfauna (UK) Ltd., Wyton, Huntingdon, Cambridgeshire, UK
Age at study initiation: 8-12 weeks
Weight at study initiation: males 231-256 g; females 210-255 g
Fasting period before study: None
Housing: Solid floor polypropylene cages with sawdust bedding
Diet: Rat and Mouse expanded Diet No. 1 (Special Diet Services Ltd., Witham, Essex, UK) ad libitum
Water: Mains drinking water ad libitum
Acclimation period: At least 5 days

ENVIRONMENTAL CONDITIONS
Temperature: 20-21°C
Humidity: 45-68%
Air changes: approximately 15 per hour
Photoperiod: 12 hrs dark / 12 hrs light
IN-LIFE DATES: From: 22 September 1988 To: 6 October 1988

Administration/exposure:

Type of coverage: occlusive
Vehicle: unchanged (no vehicle)
TEST SITE
Area of exposure: shorn skin on back and flanks
% coverage: 10%
Type of wrap if used: aluminium foil occluded with double layers of adhesive strapping wound around trunk of animal

REMOVAL OF TEST SUBSTANCE
Washing (if done): with moist cotton wool
Time after start of exposure: 24 hours

TEST MATERIAL
Amount(s) applied (volume or weight with unit): 2.06 mL/kg bodyweight
Constant volume or concentration used: yes

Duration of exposure: 24 hours
Doses: 2000 mg/kg bodyweight
No. of animals per sex per dose: 5
Control animals: no
Duration of observation period following administration: 14 days
Frequency of observations and weighing: Observed 1 and 4 hours after dosing and daily thereafter for 14 days. Bodyweights recorded on day of treatment and on days 7 and 14
Necropsy of survivors performed: no
Statistics: None, acute LD50 estimated.

Results and discussion:

LD50 (male/female) > 2000 mg/kg bw

Mortality: none
Clinical signs: Vocalisation, lasting up to 30 minutes, noted in all animals after dosing. Hunched posture, lethargy, piloerection, erythema and oedema present in all animals on day 1. Isolated incidences of red/brown staining of snout and ptosis seen. All animals showed signs of eschar by day 3 which persisted until days 10 or 12. All treatment sites appeared normal by end of study.
Body weight: All animals showed expected bodyweight gain.
Gross pathology: No abnormalities were seen.

Reliability: 1 (reliable without restriction)

Study 5

Data source: ECHA web-site - Exp Key Acute toxicity: inhalation.004
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=82df06fc-bc89-4e8b-9bdf-2162c101e2b6

Study reference:

Author not specified. Report date 1981-04-29

Detailed study summary and results:

Groups of 6 male and 6 female B6C3F1 mice were exposed (whole body) to 46, 130, 260 or 557 ppm dicyclopentadiene vapour for 6 hours and then observed daily for up to 14 days. At 557 and 260 ppm, all animals died within 24 hours of exposure. At 130 ppm, 2 males were found dead on the day after exposure, 1 female died immediately post exposure and 2 died on the day following exposure. There were no deaths at 46 ppm. C linical signs included loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, clear nasal discharge, loss of coordination and convulsions prior to death. The LC50 was 143 ppm (male) and 126 ppm (female), equivalent to 774 and 703 mg/m3 respectively.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)

Deviations: yes 6 hour exposure
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: clear colourless liquid at room temperature
Analytical purity: ~97% endo- and ~1% cyclopentadiene

Test animals:

Species: mouse
Strain: B6C3F1
Sex: male/female

TEST ANIMALS
Source: Harlan Industries Inc., Indianapolis, Indiana, USA
Age at study initiation: approximately 6-7 weeks old
Weight at study initiation: no data
Fasting period before study: no data
Housing: 2 per cage in stainless steel cages
Diet: powdered chow diet ad libitum except during exposure
Water: ad libitum except during exposure
Acclimation period: approximately 2 weeks

ENVIRONMENTAL CONDITIONS
Temperature: 69-74°F
Humidity: 30-63%
Photoperiod: 12 hrs dark /12 hrs light

IN-LIFE DATES: no data

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

GENERATION OF TEST ATMOSPHERE / CHAMBER DESCRIPTION
Dicyclopentadiene vapour was generated inside a heated Pyrex tube to achieve complete vaporization while keeping temperature below the point (35°C) at which fracturing to monomer occurred.

TEST ATMOSPHERE
Chamber concentrations of DCPD and cyclopentadiene (CPD) were monitored by gas chromatography/flame ionization detection with detection limit of 0.05 ppm for both compounds.

Analytical verification of test atmosphere concentrations: yes by gas chromatography/flame ionization detection
Duration of exposure: 6 h

Target concentrations were 50, 150, 300 and 600 ppm.
Actual exposure concentrations were 46, 130, 260 and 557ppm.
No. of animals per sex per dose: 6
Control animals: no data
Duration of observation period following administration: 14 days
Frequency of observations: animals were observed daily for clinical signs
Necropsy of survivors performed: yes
Statistics: LC50 was calculated by the method of moving averages.

Results and discussion:

LC50 (male) = 143 ppm
95% CL = 130 157
Exp. Duration = 6 h
Remarks = 774 mg/m3 air (analytical)

LC50 (female) = 130 ppm
95% CL = 103 153
Exp. Duration = 6 h
Remarks = 703 mg/m3 (analytical)

LC50 (male/female) = 738.5 mg/m³ air (analytical)
Exp. Duration = 6 h

NOAEC (male/female) for irregular breathing, stereotypic behaviour = 46 ppm
Remarks = 248.74 mg/m3

Mortality: There were mortalities in male and female mice exposed to 557 and 260 ppm.

Incidence of mortality following single 6-hour inhalation exposure

Target Concentration (ppm)	Dead/dosed		Comment
	male	female	
600	6/6	6/6	Males: 3 dead during exposure. 1 died immediately post-exposure and 1 post-exposure. 1 died the day following exposure. Females: 1 dead during exposure. 2 died immediately post-exposure. 3 died the day following exposure.
300	6/6	6/6	Males: All found dead the day after exposure. Females: 1 dead during exposure. 3 died immediately post-exposure. 2 died the day following exposure.
150	2/6	3/6	Males: 2 found dead the day after exposure. Females: 1 died immediately post-exposure. 2 died the day following exposure.
50	0/6	0/6	

Clinical signs: Male and female mice at 557 ppm showed loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, clear nasal discharge and deaths. At 260 ppm, both sexes showed stereotypic behaviour, respiratory difficulty, impaired gait, loss of coordination and convulsions prior to death. At 130 ppm, mice displayed irregular breathing and stereotypic behaviour; females also showed loss of coordination and slight tremors. No treatment-related clinical signs were observed in mice exposed to 46 ppm.

Body weight: no data
Gross pathology: There were no gross pathological effects noted at necropsy.

Reliability: 1 (reliable without restriction)

Study 6

Data source: ECHA web-site - Exp Key Acute toxicity: inhalation.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=e5f7b048-d4e3-4a3c-9581-88c5438f307e

Study reference:

Author not specified. Report date 1981-04-29

Detailed study summary and results:

Groups of 6 male and 6 female Fischer 344 rats were exposed (whole body) to 46, 130, 260 or 557 ppm dicyclopentadiene vapour for 6 hours and then observed daily for up to 14 days. At 557 ppm, one male died during exposure, 3 died immediately post-exposure and 2 were found dead on the day after exposure; all females were found dead on the day after exposure. At 260 ppm, two males were found dead on the day after exposure, all females survived. Clinical signs included loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, nasal discharge and convulsions. The LC50 was 284 ppm (male) and 353 ppm (female), equivalent to 1536 and 1910 mg/m3 respectively.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
Deviations: yes 6 hour exposure
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene (DCPD)
CAS number: 77-73-6
Physical state: clear colourless liquid at room temperature
Analytical purity: ~97% endo- and ~1% cyclopentadiene

Test animals:

Species: rat
Strain: Fischer 344
Sex: male/female

TEST ANIMALS
Source: Microbiological Associates, Walkersville, Maryland, USA
Age at study initiation: no data
Weight at study initiation: no data
Fasting period before study: no

Housing: 2 per cage in stainless steel cages
Diet: powdered chow diet ad libitum except during exposure
Water: ad libitum except during exposure
Acclimation period: approximately 2 weeks

ENVIRONMENTAL CONDITIONS
Temperature: 69-74°F
Humidity: 30-63%
Photoperiod: 12 hrs dark /12 hrs light

IN-LIFE DATES: no data

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

GENERATION OF TEST ATMOSPHERE / CHAMBER DESCRIPTION
Dicyclopentadiene vapour was generated inside a heated Pyrex tube to achieve complete vaporization while keeping temperature below the point (35°C) at which fracturing to monomer occurred.

TEST ATMOSPHERE
Chamber concentrations of dicyclopentadiene and cyclopentadiene (CPD) were monitored by gas chromatography/flame ionization detection with detection limit of 0.05 ppm for both compounds.

Analytical verification of test atmosphere concentrations: yes by gas chromatography/flame ionization detection
Duration of exposure: 6 h
Target concentrations were 50, 150, 300 and 600 ppm.
Actual exposure concentrations were 46, 130, 260 and 557 ppm.
No. of animals per sex per dose: 6
Control animals: no data
Duration of observation period following administration: 14 days
Frequency of observations: animals were observed daily for clinical signs
Necropsy of survivors performed: yes
Statistics: LC50 was calculated by the method of moving averages.

Results and discussion:

LC50 (male) = 284 ppm
95% CL = 236 341
Exp. Duration = 6 h
Remarks = 1536 mg/m3 air (analytical)

LC50 (female) = 353 ppm
95% CL = 322 387
Exp. Duration = 6 h
Remarks = 1910 mg/m3 air (analytical)

LC50 (male/female) = 1723 mg/m³ air (analytical)

Exp. Duration = 6 h

NOAEC (male/female) for irregular breathing, stereotypic behaviour = 46 ppm
Remarks = 248.74 mg/m3

Mortality: There were mortalities in male and female rats exposed to 557 or 260 ppm.

Incidence of mortality following single 6-hour inhalation exposure

Target Concentration (ppm)	Dead/dosed		Comment
	male	female	
600	6/6	6/6	Males: One died during exposure. 3 died immediately post-exposure. 2 found dead on the day after exposure. Females: All found dead on the day after exposure.
300	2/6	0/6	Males: 2 found dead the day after exposure.
150	0/6	0/6	
50	0/6	0/6	

Clinical signs: Male and female rats at 557 ppm showed loss of righting reflex, impaired gait, stereotypic behaviour, laboured breathing, nasal discharge, convulsions and death. At 260 ppm, both sexes showed stereotypic behaviour, respiratory difficulty and nasal discharge. In rats dying from exposure to dicyclopentadiene, convulsions were observed immediately before death. At 130 ppm, the only sign observed in both sexes, was a somewhat sluggish movement. No treatment-related clinical signs were observed in rats exposed to 46 ppm. In rats that did not die during the study, all clinical signs cleared by day 2.

Body weight: no data
Gross pathology: There were no gross pathological effects noted at necropsy.

Reliability: 1 (reliable without restriction)

Study 7

Data source: ECHA web-site - Exp Supporting Acute toxicity: inhalation.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=64467e0d-31fd-4bb9-b21d-2e6f6c5a11ea

Study reference:

Author not specified. Publication, 1971

Detailed study summary and results:

Groups of 6 male and female albino rats were exposed (whole body) to dicyclopentadine vapour for 4 hours and then observed daily for up to 14 days. The lowest effect level was 272 ppm, which caused irritation of the extremities within 60 minutes in males and females and the death of one male. The acute inhalation LC50 was 359.4 ppm (male) and 385.2 ppm (female) equivalent to 1943 and 2083 mg/m3, respectively.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
GLP compliance: no

Test substance:

Name of test material (as cited in study report): Isomeric mixture of endo/exo dicyclopentadiene in a 95:5 ratio
CAS number: 77-73-6
Physical state: Clear colourless liquid
Purity: 98.3 %
Molecular weight: 132.21
Boiling point at 100 mm Hg: 105°C
Specific gravity: 0.9825 at 20/20°C
Flash point (Tag upon cup): 150°F
Vapour pressure at 20°C: 1.4 mm
Melting point: 16-18°C

Test animals:

Species: rat
Strain: other: albino
Sex: male/female
Weight: 105-214 g (males), 100-176 g (females)

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

Analytical verification of test atmosphere concentrations: yes, gas chromatography
Duration of exposure: 4 h
Concentrations: no data
No. of animals per sex per dose: 6
Control animals: no data
Details on study design: 14 day observation period following 4 hour exposure
Statistics:no data

Results and discussion:

LC50 (male) = 359.4 ppm
95% CL = 290.2 445.1
Exp. Duration = 4 h
Remarks = 1943 mg/m3

LC50 (female) = 385.2 ppm
95% CL = 311.1 477.1
Exp. Duration = 4 h
Remarks = 2083 mg/m3

Mortality: 1 male died at 272 ppm.

Clinical signs: The lowest concentration at which effects were seen was 272 ppm where irritation of extremities was seen within 60 minutes in both males and females. Eye irritation, poor coordination and convulsions were generally observed prior to death. No other details were reported.

Body weight: Survivors gained weight during the 14 day observation period.
Gross pathology: No data

Conclusions: Following a 4 hour, whole body, inhalation exposure to dicyclopentadine vapour, the LC50 for rats was 359.4 ppm (male) and 385.2 ppm (female) equivalent to 1943 and 2083 mg/m3, respectively.

Reliability: 2 (reliable with restrictions)

Study 8

Data source: ECHA web-site - Exp Supporting Acute toxicity: inhalation.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/3/3/?documentUUID=2aa40c8f-1d60-460c-939d-1b8afaf4c3cf

Study reference:

Author not specified. Publication, 1971

Detailed study summary and results:

Individual female beagle dogs were exposed (whole body) to dicyclopentadiene vapour for 4 hours and then observed daily for up to 14 days. 773 ppm was lethal to the 1 female dog within 1 hour of exposure; clinical signs included irritation of eyes, nose and extremities within 30 minutes, followed by tonic and clonic convulsions preceding death. During exposure, tremors were seen at 458 and 272 ppm, eye and nose irritation and lacrimation were also observed during exposure to 458 ppm. The only clinical sign seen at 68 ppm was urination immediately following exposure. The 4 hour inhalation LC50 in the dog was therefore between 458-773 ppm.

Test type:

Test type: standard acute method
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
Deviations: yes 1 dog/group
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): Isomeric mixture of endo/exo dicyclopentadiene in a 95:5 ratio
CAS number: 77-73-6
Physical state: Clear colourless liquid

Purity: 98.3 %
Molecular weight: 132.21
Boiling point at 100 mm Hg: 105°C
Specific gravity: 0.9825 at 20/20°C
Flash point (Tag upon cup): 150°F
Vapour pressure at 20°C: 1.4 mm
Melting point: 16-18°C

Test animals:

Species: dog
Strain: other: other: Beagle
Sex: female
Weight: 7100, 7600, 7700 and 10800 g

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air

Analytical verification of test atmosphere concentrations: yes, gas chromatography
Duration of exposure: ca. 1 ca. 4 h
Concentrations: 68, 272, 458 and 773 ppm (measured concentrations)
No. of animals per sex per dose: 1
Control animals: no data
Details on study design: 14 day observation period following 4 hour exposure
Statistics:no data

Results and discussion:

LC50 (female) = 458 - 773 ppm
Exp. Duration = 4 h

LC50 (female) = 2478 - 4181 mg/m³ air
Exp. Duration = 4 h

Mortality: After 1 hour exposure at 773 ppm one female died.

Clinical signs:
773 ppm: irritation of eyes, nose and extremities within 30 minutes, followed by tonic and clonic convulsions preceding death within 60 minutes.
458 ppm: tremors within 15 minutes, with eye and nose irritation and lacrimation within 50 minutes, no death.
272 ppm: tremors within 180 minutes.
68 ppm (approximate): dog urinated small amounts, several times immediately following exposure.

Reliability: 2 (reliable with restrictions)

Specific target organ toxicity (single exposure) - human data

Study 1

Data source: ECHA website –Direct observations: clinical cases, poisoning incidents and other
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/11/4

Study reference:

Author not specified. Publication, 1971.
Study type: study with volunteers
Endpoint addressed: respiratory and eye irritation
Test guideline: no guideline followed
Principles of method if other than guideline: Determination of odour threshold and human sensory response
GLP compliance: no data

Detailed study summary and results:

Details on test material:
- Name of test material (as cited in study report): dicyclopentadiene
- Physical state: Clear colourless liquid
- Analytical purity: 96.7%, isomeric mixture of endo/exo in a 95:5 ratio
- Molecular weight: 132.21
- Boiling point at 100 mm Hg: 105°C
- Specific gravity: 0.9816 at 20/20°C
- Flash point (Tag upon cup): 150°F
- Vapour pressure at 20°C, 1.4 mm
- Melting point: 16-18°C
- Inhibitor (tertiary butyl catechol), 141 ppm

Type of population: other: volunteers
Subjects:
- Number of subjects exposed: 3 (odour threshold), 2 (sensory response)
- Age: 24-47 years
- Subjects: blind to inhaled concentration

Ethical approval: no data
Route of exposure: inhalation
Reason of exposure: intentional
Exposure assessment: measured
Details on exposure: Exposure concentrations not analysed in odour threshold study. Analysed by gas chromatography in the sensory response test.
Exposure was in a glass-lined 12800 L room from which the vapour-air mixture was exhausted at 2500-3200 L/min.

Results and discussions:
Clinical signs: Human sensory response test: During the 30-min exposure to 1 ppm, one subject experienced slight eye and throat irritation at 7 min and one subject reported olfactory fatigue after 24 min.
No olfactory fatigue was reported by either subject during the 30-min exposure to 5.5 ppm dicyclopentadiene vapour. Eye irritation was reported by one subject after 10 min at this concentration. One subject could taste dicyclopentadiene for 1 hr after the 5.5 ppm exposure.
Results of examinations: Odour threshold study: The odour threshold of dicyclopentadiene vapour for man appears to be slightly below a corrected 0.003 ppm.
Responses for 10 second inhalation period as follows: % incidence of odour detection 100, 67 and 0 % for corrected concentrations of 0.006, 0.003 and 0.0006 ppm respectively (no of subjects 6, 6 and 12 respectively).

Human sensory response test: During the 30-min exposure to 1 ppm, one subject experienced slight eye and throat irritation at 7 min and one subject reported olfactory fatigue after 24 min. No olfactory fatigue was reported by either subject during the 30-min exposure to 5.5 ppm dicyclopentadiene vapour. Eye irritation was reported by one subject after 10 min at this concentration. One subject could taste dicyclopentadiene for 1 hr after the 5.5 ppm exposure.

Conclusions: Human sensory response studies showed that dicyclopentadiene vapour can be detected at 0.003 ppm. Following inhalation of 1 ppm or 5.5 ppm for 30 minutes, sporadic eye and throat irritation was reported. It was therefore recommended that workmen should not inhale more than 5 ppm dicyclopentadiene for extended periods (i.e. 8 hours/day, 5 days/week).

Executive summary: Human sensory response studies showed that dicyclopentadiene vapour can be detected at 0.003 ppm. Following inhalation of dicyclopentadiene vapour at concentrations of 1 ppm or 5.5 ppm for 30 minutes, sporadic eye and throat irritation was reported in two volunteers.

Reliability: 2 (reliable with restrictions)

Study 2

Data source: International Chemical Safety Cards (ICSC) provided by NIOSH. ICSC: 0873

Link: http://www.cdc.gov/niosh/ipcsneng/neng0873.html

Study reference:

International Chemical Safety Card on Dicyclopentadiene. Last update: July 1, 2014

Detailed study summary and results:

/TYPES OF EXPOSURE / INHALATION: Cough. Sore Throat. Headache.

Specific target organ toxicity (single exposure) - other data

No data available.

3.10 Specific target organ toxicity (repeated exposure)

Specific target organ toxicity (repeated exposure) - animal data

Study 1

Data source: ECHA website - Exp Key Repeated dose toxicity: oral.002
Link:http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/6/2/?documentUUID=2c6d401a-d631-4457-82e4-e76835f8c59d

Study reference:

Information sheet dated 1998-03-30.

Detailed study summary and results:

In a combined repeat dose toxicity study with reproduction/developmental toxicity screening, groups of 10 males and 10 females were dosed by oral gavage with solutions of 0, 4, 20 or 100 mg/kg DCPD in olive oil. Animals were dosed for 2 weeks prior to mating and during mating (approximately 2 weeks). Males and females were then dosed through gestation until day 3 of lactation. Females were killed on day 4 of lactation and males were killed on day 45 of the study. Two females at 100 mg/kg/day died during the study and surviving males and females showed decreased food consumption and bodyweight gain at this dose level. Pathological changes in the liver and kidney were seen in males dosed at 100 mg/kg/day (single cell necrosis in the liver, hyaline droplet formation and basophilic changes in the tubular epithelium of the kidney) and an increase in fatty droplets in the adrenals was observed in both males and females in the 100 mg/kg group. Similar changes were seen in the kidney and adrenals of some male rats dosed at 20 mg/kg group male rats. The no effect level for systemic toxicity was therefore considered to be 20 mg/kg/day for females and 4 mg/kg/day for male rats.

Test type:

Test type: combined repeated dose and reproduction / developmental screening
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): dicyclopentadiene
CAS number: 77-73-6
Analytical purity: 94.65%
Physical state: colourless liquid with a camphor-like odour

Lot/batch No.: D93028
Stability under test conditions: confirmed to be stable by the manufacturer for the study period
Storage condition of test material: room temperature

Test animals:

Species: rat
Strain: other: Sprague Dawley Crj:CD(SD)
Sex: male/female
No. of animals per sex per dose: 10

TEST ANIMALS
- Source: Charles River Japan, Inc.
- Age at study initiation: 8 weeks
- Weight at study initiation: males 304-339 g, females 186-227 g
- Housing: individually, except during mating, in polycarbonate cages
- Diet: CRF-1 (Oriental Yeast Co) assumed ad libitum
- Water: ultraviolet irradiated water (assumed ad libitum)
- Acclimation period: 6 days

ENVIRONMENTAL CONDITIONS
- Temperature: 20-25°C
- Humidity: 40-70%
- Air changes: approximately 12 per hr
- Photoperiod: 12 hrs dark / 12 hrs light

IN-LIFE DATES: Not reported

Administration/exposure:

Route of administration: oral
Vehicle: olive oil
Details on oral exposure: PREPARATION OF DOSING SOLUTIONS: Test substance mixed with olive oil, dose rate 10mL/kg bodyweight
Analytical verification of doses or concentrations: yes
Details on analytical verification of doses or concentrations: Stability and achieved concentration of dosing preparations was confirmed prior to dosing

Duration of treatment / exposure: Males 44 days; Females from 14 days before mating through gestation and parturition until day 3 of lactation
Frequency of treatment: once daily
Doses/concentrations: 0, 4, 20 or 100 mg/kg/day
Basis: other: nominal in olive oil
No. of animals per sex per dose: 10
Control animals: yes, concurrent vehicle

Details on study design:
- Dose selection rationale: Based on the results obtained in a 10 day oral dosing preliminary study where doses of 0, 30, 100 and 300 mg/kg were administered.

Examinations:
Observations and examinations performed and frequency:

CLINICAL OBSERVATIONS: Yes
- Time schedule: daily

BODY WEIGHT: Yes
- Time schedule for examinations: weekly

FOOD CONSUMPTION: Yes

FOOD EFFICIENCY: No

WATER CONSUMPTION: No

OPHTHALMOSCOPIC EXAMINATION: No

HAEMATOLOGY: Yes (males only)
- Time schedule for collection of blood: termination
- Anaesthetic used for blood collection: Yes (sodium thiopental)
- Animals fasted: Yes (assumed)
- How many animals: 10/group
- Parameters examined: red blood cell, white blood cell, platelets, haemoglobin, haematocrit, differential white cell count, reticulocyte, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration

CLINICAL CHEMISTRY: Yes (males only)
- Time schedule for collection of blood: termination
- Anaesthetic used for blood collection: Yes (sodium thiopental)
- Animals fasted: Yes (assumed)
- How many animals: 10/group
- Parameters examined: GOT, GPT, ALP, ¿-GTP, urea nitrogen, glucose, total cholesterol, triglycerides, creatinine, total bilirubin, total protein, albumin, A/G ratio, calcium, inorganic phosphorus, sodium, potassium, chloride

URINALYSIS: No

NEUROBEHAVIOURAL EXAMINATION: No

Sacrifice and pathology:
GROSS PATHOLOGY: Yes

ORGAN WEIGHTS: Yes
- organs weighed: thymus, liver, kidneys, adrenals, testes, epididymes

HISTOPATHOLOGY: Yes (liver, kidney and adrenals all groups, other tissues controls and 100 mg/kg groups only)
- tissues examined: thymus, liver, kidneys, adrenals, testes, epididymes, brain, heart, spleen, ovaries,

Statistics

Bartlett's test if uniformly distributed analysis of variance, Kruskal-Wallis if non-uniform for quantitative data. When significant differences found between groups, Dunnett-type test or Scheff test. Significance level of 5% or less.

Results:

Endpoint: NOAEL
Effect level: 4 mg/kg bw/day (actual dose received)
Sex: male
Basis for effect level / Remarks: histological changes in kidneys and adrenals at 20 mg/kg/day

Endpoint: NOAEL
Effect level: 20 mg/kg bw/day (actual dose received)
Sex: female
Basis for effect level / Remarks: 2/10 deaths, lower body weight and food consumption and histological changes in liver and kidney at 100 mg/kg/day

Results of examinations:
Clinical signs and mortality: yes
Body weight and weight gain: yes
Food efficiency: no data
Ophthalmoscopic examination: no data
Haematology: no effects
Clinical chemistry: yes
Urinalysis: no data
Neurobehaviour: not examined
Organ weights: yes
Gross pathology: no effects
Histopathology: non-neoplastic: yes

Details on results:
CLINICAL SIGNS AND MORTALITY
- Two females in the high dose (100 mg/kg) group died. Transient salivation after dosing at 100 mg/kg for the initial 8 days of dosing was present in approximately half of the males and females. Also occasionally present in males at the two lower doses.

BODY WEIGHT AND WEIGHT GAIN
- Males and surviving females showed slight suppression of body wt gain.

FOOD CONSUMPTION AND COMPOUND INTAKE (if feeding study)
- Males and surviving females showed slightly decreased food consumption.

HAEMATOLOGY
- No treatment-related effects

CLINICAL CHEMISTRY
- Blood chemistry of 100 mg/kg males showed increase in glutamic oxaloacetic transaminase (GOT) and glutamic-pyruvate transaminase (GPT).

ORGAN WEIGHTS
- Increased weight of liver and kidneys of male rats given 100 mg/kg (neither achieved statistical significance) and statistically significantly increased actual and relative liver weight in males at 20 mg/kg/day.

HISTOPATHOLOGY: NON-NEOPLASTIC
- In male rats given 100 mg/kg, single cell necrosis in liver, and hyaline droplets and basophilic changes in tubular epithelium of kidneys under microscopic examination were observed. Increase in fatty droplets in fascicular zone of adrenals was observed in both males and females in the 100 mg/kg group. Similar histopathological changes were seen in kidneys of four 20 mg/kg group male rats and in adrenals of 20 mg/kg group male rats.

Conclusions: Dicyclopentadiene induced systemic toxicity in male and female rats including death of two females at the 100 mg/kg/day dose level.

Reliability: 2 (reliable with restrictions)

Study 2

Data source: ECHA website - Exp Supporting Repeated dose toxicity: oral.001
Link:http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/6/2/?documentUUID=266d326d-961e-420e-81ba-f37f011c63ff

Study reference:

Author not specified. Report date 1980.

Detailed study summary and results:

Dicyclopentadiene was administered by incorporation into the diet at concentrations of 100, 300 and 1000 ppm to male and female beagle dogs for 13 weeks. The animals were observed daily for general condition and behaviour. Clinical pathological evaluations, including analysis of the clinical chemical constituents of serum, urine and haemograms, were performed at approximately monthly intervals. Tissues from the control and high dose dogs were histopathologically evaluated. Based on the results obtained using these criteria, it was concluded that treatment produced no significant toxicity with the possible exception of minor indications of intestinal distress expressed as vomiting and soft stools among dogs of the treated groups, especially the highest dose (1000 ppm).

Test type:

Test type: subchronic
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 409 (Repeated Dose 90-Day Oral Toxicity in Non-Rodents)
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): dicyclopentadiene (DCPD)
CAS number: 77-73-6
Analytical purity: 98-99%

Physical state: colourless liquid with a camphor-like odour
Lot/batch No.: LBI 763A
Analysis by UC-W98 column. Retention time was 1.9 minutes (trace impurities noted at approximately 1.5 and 2.1 minutes)

Test animals:

Species: dog
Strain: other: Beagle
Sex: male/female
No. of animals per sex per dose: 4

TEST ANIMALS

- Source: Laboratory Research Enterprises Inc., Kalamazoo, Michigan, USA
- Age at study initiation: Approximately 9 months
- Weight at study initiation: 10.0-12.1 kg (males) and 8.1-9.0 kg (females)
- Housing: Individually in stainless steel cages
- Diet: Purina Dog Chow ad libitum
- Water: Mains water ad libitum
- Acclimation period: 4 months

ENVIRONMENTAL CONDITIONS
- Temperature (°C): no data. Temperature controlled
- Humidity (%): no data
- Air changes (per hr): no data
- Photoperiod: 12 hrs dark / 12 hrs light)

IN-LIFE DATES: First dose: 10 May 1978

Administration/exposure:

Route of administration: oral: feed
Vehicle: other: diet
Details on oral exposure: DIET PREPARATION
- Rate of preparation of diet (frequency): The feed and test material were mixed weekly
- Mixing appropriate amounts with (Type of food): Purina Dog Chow
- Storage temperature of food: no data
- A premix was prepared in corn oil, manually mixed with the appropriate amount of test material and blended with the dog meal for 20 minutes in a blender
Analytical verification of doses or concentrations: yes
Details on analytical verification of doses or concentrations: A sample of each weekly formulation was analysed.

Duration of treatment / exposure: 13 weeks
Frequency of treatment: daily
Doses/concentrations: 0, 100, 300 and 1000 ppm
Basis: other: nominal in diet
No. of animals per sex per dose: 4
Control animals: yes

Examinations:
Observations and examinations performed and frequency:

CAGE SIDE OBSERVATIONS: Yes
- Time schedule: Daily

DETAILED CLINICAL OBSERVATIONS: No data

BODY WEIGHT: Yes
- Time schedule for examinations: Weekly

FOOD CONSUMPTION: Daily
- Food consumption for each animal determined and mean daily diet consumption calculated as g food/day: Yes
- Compound intake calculated as time-weighted averages from the consumption and body weight gain data: No data

FOOD EFFICIENCY:
- Body weight gain in kg/food consumption in kg per unit time X 100 calculated as time-weighted averages from the consumption and body weight gain data: No data

OPHTHALMOSCOPIC EXAMINATION:
- Time schedule: Initially and before termination

HAEMATOLOGY: Yes
- Time schedule for collection of blood: Initially and at 4, 8 and 13 weeks
- Anaesthetic used for blood collection: No data
- Animals fasted: Yes
- How many animals: All
- Parameters checked: Haemoglobin, erythrocytes, leukocytes, differential white cell count and packed cell volume

CLINICAL CHEMISTRY: Yes
- Time schedule for collection of blood: Initially and at 4, 8 and 13 weeks
- Animals fasted: Yes
- How many animals: All
- Parameters checked: glucose, calcium, urea nitrogen, serum glutamic-pyruvic transaminase, serum glutamic-oxaloacetic transaminase, uric acid, alkaline phosphatase, total protein, albumin, cholesterol, lactic dehydrogenase, phosphorus, bilirubin; (sodium, chloride and potassium taken at pre-dose only)

URINALYSIS: Yes
- Time schedule for collection of urine: Initially and at 8 and 13 weeks.
- Metabolism cages used for collection of urine: Overnight urine collection
- Animals fasted: Yes
- Parameters checked: specific gravity, pH, colour, sugar, albumin, ketones, occult blood, bilirubin, microscopic examination of sediment

NEUROBEHAVIOURAL EXAMINATION: No data

Sacrifice and pathology:
GROSS PATHOLOGY: Yes

- The following organs were weighed: brain, thyroid, heart, liver, spleen, kidneys, adrenal glands, testes with epididymis, ovaries.

HISTOPATHOLOGY: Yes
- The following organs and tissues from all animals were taken and processed for histopathology: brain, pituitary, spinal cord, eye, stomach, small intestine, large intestine, thyroid, pancreas, lung, heart, rib junction, gallbladder, liver, spleen, kidneys, adrenal glands, testes with epididymis, prostate, ovaries, uterus, bone marrow, skeletal muscle and nerve, urinary bladder, mammary gland, mesenteric lymph node and any abnormal tissue.
- Tissues from the control and high dose animals were examined histopathologically.

Statistics
Statistical analysis was performed using Dunnett's t-test to determine differences between treated and control means of the same sex. A probability value of <0.05 was used as a basis of statistical inference.

Results:

Endpoint: NOAEL
Effect level: 1000 ppm
Sex: male/ female
Basis for effect level / Remarks: (25 mg/kg/d) no significant systemic toxicity at highest dose tested

Results of examinations:
Clinical signs and mortality: yes
Body weight and weight gain: no effects
Food consumption and compound intake (if feeding study): no effects
Food efficiency: not examined
Water consumption and compound intake (if drinking water study): not examined
Ophthalmoscopic examination: no effects
Haematology: no effects
Clinical chemistry: no effects
Urinalysis: no effects
Neurobehaviour: not examined
Organ weights: no effects
Gross pathology: no effects
Histopathology: non-neoplastic: no effects

Details on results:
CLINICAL SIGNS AND MORTALITY
There was a slightly higher frequency of vomiting and soft stools among the treated dogs, especially those of the high level (1000 ppm). However, these signs were also occasionally observed among the control dogs.

CLINICAL CHEMISTRY
An apparent increase in serum glucose at the 1000 ppm level for males at termination was judged not to be of significant as both male dogs on which data were available were within normal limits.

Any other information on results incl. tables: There was no evidence of significant toxicity with the possible exception of minor indications of intestinal distress expressed as vomiting and soft stools among dogs of the treated groups, especially the highest dose (1000 ppm).

Reliability: 2 (reliable with restrictions)

Study 3

Data source: HSDB: DICYCLOPENTADIENE - Non-Human Toxicity Excerpts - Developmental or Reproductive Toxicity
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

Jamieson, H.M., Delaney, J.C., Wolfe, G.W. and Chapin, R.E. (1995) "Reproductive effects of dicyclopentadiene in S-D rats assessed by a continuous breeding protocol." The Toxicologist. 15:166. Abstract No. 880

Test type:

Test type: two-generation study
Test guideline: Reproductive Assessment by Continuous Breeding Protocol (NTP, 1989)
GLP compliance: yes

Test substance:

Name of test substance: Dicyclopentadiene
Source: no data available
Analitical purity: no data available

Test animals:

Species: rat
Strain: Sprague-Dawley
Sex: male/female

TEST ANIMALS
- The rats were housed individually for one week and then cohabitated for 16 weeks (20 animals/sex/group)
- No further details

Administration/exposure:

Route of administration: oral: gavage
Details on exposure: DCP was administered by gavage in corn oil at dose levels of 10, 30, and 100 mg/kg

Results and discussion:

DCPD was administered by gavage in corn oil at dose levels of 10, 30, and 100 mg/kg to animals that were housed individually for one week and then cohabitated for 16 weeks (20 animals/sex/group). At necropsy, DCPD caused a 2%, 7%, and 17% increase in liver weights and a 16%, 15%, and 16% increase in kidney weights in males from the 10, 30, and 100

mg/kg groups, respectively. Microscopically, an increase in the incidence of clear cell foci was observed in the livers of 30 and 100 mg/kg rats.

Reliability: this information is taken from a reliable peer reviewed data source: HSDB

Study 4

Data source: ECHA website - Exp Key Repeated dose toxicity: inhalation.001
Link:http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/6/3/?documentUUID=f072b765-156b-42b0-a251-6e83d0630e92

Study reference:

Study report dated 1982 and publication Bevan C, Snellings W, Dodd D and Egan G "Subchronic Toxicity Study Of Dicyclopentadiene Vapour In Rats", 1992, Toxicol. Ind. Health Vol 8 (6) 353-367

Detailed study summary and results:

Fischer 344 rats were exposed by inhalation to 0, 1, 5 or 50 ppm dicyclopentadiene vapour 6 hr/day, 5 days/week for 13 weeks, followed by a 13-week recovery period. Animals were euthanized following completion of exposure at 2, 6, or 13 weeks and at post exposure weeks 4 or 13. No mortality, overt signs of toxicity, body weight changes, haematological or clinical chemistry values were related to exposure.

At 50 ppm, relative liver weights were significantly increased in males but with no accompanying histopathological changes. Males at this exposure level also showed alterations in renal function during the study (reduced urine specific gravity and urine osmolality, changes in sodium and potassium excretion rates and increased urine volume) which were not present during the recovery period.

The only histopathological findings were in the kidney, in male rats only, particularly those exposed to 5.1 or 51 ppm. Hyaline droplets accumulated in the proximal convoluted tubule during the exposure period and resolved during the recovery period. Males at 5.1 and 51 ppm also had protein accumulation, tubular hyperplasia (regeneration), tubular proteinosis, interstitial nephritis and glomerular basement thickening. These changes did not resolve by the end of the recovery period and were also seen in some males in the control and 1 ppm groups; they are consistent with a male, rat-specific, glomerulonephropathy, which is seen spontaneously in older male rats.

This study indicates an overall low degree of systemic toxicity following subchronic inhalation exposure of dicyclopentadiene at exposure levels up to 50 ppm.

Test type:

Test type: subchronic
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 413 (Subchronic Inhalation Toxicity: 90-Day)
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): dicyclopentadiene (DCPD)
CAS number: 77-73-6
Source: Exxon Chemical Company, Baton Rouge, LA, USA
Sample reference: BRRC 43-156
Physical state: clear, colourless liquid
Analytical purity: =95% endo-DCPD, 0.5% exo-DCPD
Impurities (identity and concentrations): several impurities of which only cyclopentadiene. and isoprene were present at =0.5%
Stability under test conditions: The composition remained stable throughout the study

Test animals:

Species: rat
Strain: other: Fischer 344
Sex: male/female
No. of animals per sex per dose: 51

TEST ANIMALS

TEST ANIMALS
- Source: Charles River Breeding Laboratory (Portage, MI, USA)
- Age: 30-34 days old on receipt
- Health assessment: confirmed following arrival
- Housing: 3/sex/cage during non-exposure period, individually during exposure, in suspended, stainless-steel cages
- Diet: NIH-07 diet ad libitum except during exposure
- Water: ad libitum except during exposure
- Acclimation period: no data

ENVIRONMENTAL CONDITIONS (ANIMAL ROOM)
- Temperature: 20-22°C
- Humidity: 40-60%
- Photoperiod: 12 hrs dark / 12 hrs light

IN-LIFE DATES: From: June 25, 1980 To: January 16, 1981

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air
Details on inhalation exposure: GENERATION OF TEST ATMOSPHERE / CHAMBER DESCRIPTION
- Exposure apparatus: 4.3 m3 stainless-steel and glass inhalation chambers
- System of generating atmosphere: Liquid dicyclopentadiene was metered from either a piston or syringe pump assembly into a heated, spiral-grooved Pyrex tube and mixed with air entering the bottom of the tube at a flow rate of approximately 2000 L/min.
- Complete vaporization of dicyclopentadiene was achieved while the temperature was kept below 35°C the point at which heat fracturing occurs producing the monomer.

TEST ATMOSPHERE
- Brief description of analytical method used: Air samples assayed using a Perkin Elmer 3920B dual column gas chromatograph equipped with a hydrogen flame ionization detector and a linear temperature programmer.
- Samples taken from breathing zone: yes
- The column was a 5 ft x 1/4 inch O.D. stainless-steel column packed with 20% SP2100 on Supelcoport (80-100 mesh) operating at 150°C.
- The nitrogen carrier flow rate was 75 mL/min, the hydrogen flow rate was 60 mL/min, and the air flow was 475 mL/min.

Analytical verification of doses or concentrations: yes
Details on analytical verification of doses or concentrations: The chamber concentration of dicyclopentadiene was measured six times per day for each exposure group.

Duration of treatment / exposure: 13 weeks
Frequency of treatment: 6 hours/day, 5 days/week

Doses/concentrations: 0, 1, 5, or 50 ppm
Basis: other: nominal conc.

Doses/concentrations: 0.0, 1.0, 5.1 and 51 ppm
Basis: other: analytical conc.

Doses/concentrations: 0, 5, 27.6, 276 mg/m3
Basis: other: analytical conc.

No. of animals per sex per dose: 51
Control animals: yes, concurrent vehicle

Details on study design:
- Post-exposure recovery period in satellite groups: up to 13 weeks
- Animals killed following completion of exposure at 2, 6, or 13 weeks and at postexposure weeks 4 or 13

Examinations:
Observations and examinations performed and frequency:

CAGE SIDE OBSERVATIONS: Yes
- Time schedule: before and after each exposure and daily (5 days/week) during the recovery period

BODY WEIGHT: Yes
- Time schedule for examinations: prior to the first exposure; weekly during the first 4 weeks of exposure and every 2 weeks thereafter; the first 5 weeks of the recovery period, and then every two weeks. All animals weighed prior to termination.

FOOD CONSUMPTION: Yes
- Frequency: during each urine collection period

WATER CONSUMPTION: Yes
- Frequency: during each urine collection period

OPHTHALMOSCOPIC EXAMINATION: Yes

- Time schedule for examinations: Prior to sacrifice
- Dose groups that were examined: High dose only in the first instance, intermediate dose and control group depending on findings

HAEMATOLOGY: Yes
- Time schedule and numbers of animals for collection of blood: all animals prior to being killed after 2, 6 and 13 weeks of exposure, and after 4 and 13 weeks post-exposure.
- Anaesthetic used for blood collection: Yes (methoxyflurane)
- Animals fasted: No
- Parameters examined: Erythrocyte count, haemoglobin, haematocrit, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration and total /differential white blood cell counts.

CLINICAL CHEMISTRY: Yes
- Time schedule and numbers of animals for collection of blood: all animals prior to being killed after 2, 6 and 13 weeks of exposure, and after 4 and 13 weeks post-exposure.
- Anaesthetic used for blood collection: Yes (methoxyflurane)
- Animals fasted: No
- Parameters examined: creatinine, urea nitrogen, calcium, phosphorus, chloride, alanine aminotransferase, aspartate aminotransferase, total protein, albumin, total bilirubin, alkaline phosphatase, glucose and osmolality.

URINALYSIS: Yes
- Time schedule for collection of urine: weekly for the first 4 weeks of the study and prior to euthanasia.
- Metabolism cages used for collection of urine: Yes
- Animals fasted: No
- Parameters examined: pH, protein, glucose, bilirubin, urobilinogen, blood, urine volume, specific gravity, osmolality, colour and turbidity, creatinine, urea nitrogen, calcium, phosphorus, chloride, sodium, potassium and microscopic analysis.
- A urinary concentration test was performed on those rats selected for sacrifice at the end of the 13-week recovery period. The test was done on Day 6 (males and females) and on Day 83 (males only) of the recovery period, and involved the collection of urine samples from rats that had been deprived of water for 16 hours. Urine samples were then collected over a 6-hour period during which the animals were deprived of both food and water.

NEUROBEHAVIOURAL EXAMINATION: No

Sacrifice and pathology:
GROSS PATHOLOGY: Yes. All animals
ORGAN WEIGHTS: Yes. Kidneys, lung, liver and testes
HISTOPATHOLOGY: Yes. The following tissues were taken and fixed: Kidneys, liver, testes, adrenals, bone and bone marrow (sternal), brain (brain stem, cerebellum, cerebrum), epididymides, eyes, heart, kidneys, larynx, liver, lungs, lymph nodes (mediastinal), muscle (gastrocnemius), nasal turbinates, parathyroids, pituitary, sciatic nerve, spleen, testes, thymus, thyroids, trachea, urinary bladder, and gross lesions. All tissues from the high-exposure and control groups were stained with haematoxylin and eosin (H&E) and examined. In the mid and low groups only kidneys and urinary bladders were examined. Kidneys and urinary bladders were stained with periodic acid and H&E.
ELECTRON MICROSCOPY: Three rats/sex/exposure group were killed at week 13 and at the end of the recovery period, and the kidneys were removed for electron microscopic evaluation.

Statistics:
Bartlett's test of homogeneity of variance to determine if the groups had equivalent variances. If the variances were not significantly different, the groups were compared using analysis of variance (ANOVA). If significant differences among the means were indicated, the Duncan's multiple range test was used to determine which dicyclopentadiene-treated groups differ from the controls.

Results:

Endpoint: NOAEC
Effect level: 50 ppm
Sex: male/ female
Basis for effect level / Remarks: 276 mg/m3. No systemic toxicity at highest dose tested

Results of examinations:
Clinical signs and mortality: no effects
Body weight and weight gain: no effects
Food consumption: no effects
Food efficiency: not examined
Water consumption: yes
Ophthalmoscopic examination: no effects
Haematology: no effects
Clinical chemistry: no effects
Urinalysis: yes
Neurobehaviour: not examined
Organ weights: yes
Gross pathology: no data
Histopathology: non-neoplastic: yes
Histopathology: neoplastic: not examined

Details on results:
WATER CONSUMPTION: In male rats, mean water consumption was significantly increased at Weeks I and 13 at 1 ppm; Week 13 at 5 ppm; and on multiple occasions, including post-exposure at 50 ppm. In female rats, mean water consumption was significantly increased at 5 ppm and 50 ppm at Weeks 13 and 50 ppm at Week 19.

URINALYSIS: Epithelial cells were seen in urine of exposed male rats: the number of epithelial cells and the number of affected animals increased during the exposure period, but were not present at 13 weeks post-exposure. Epithelial cell casts also seen in urine sediment of treated male rats during exposure but not during the recovery period. After 1 week exposure, males at 50 ppm showed decreased specific gravity and osmolality, and increased volume. These effects increased in severity during the exposure period. At the end of Week 13, urine osmolality had decreased by 14% and 32% compared to controls at 5 and 50 ppm respectively. During the recovery period, the alteration in urine osmolality and specific gravity became less apparent but still persisted in the high-dose group even after 92 days post-exposure. At 92 days post-exposure, urine osmolality at 50 ppm was 14% decreased compared to controls.

When rats were deprived of water overnight prior to urine collection, the osmolality of male rats exposed to 5 and 50 ppm of DCPD was significantly decreased (94% and 69% respectively of unexposed male rats). This effect was specific only to male rats. After 83 days postexposure, the impaired urine concentrating ability of the kidney had improved, a

difference in urine osmolality was evident only in male rats exposed to 50 ppm (87% of control).

The urinary excretion rate of Na+ in male rats exposed to 5 or 50 ppm DCPD was significantly reduced as compared to control animals, whereas the urinary excretion rate of K+ was significantly elevated at 50 ppm. These changes were first observed after two weeks of exposure and persisted throughout the exposure period. Urinary excretion rates returned to control values after a recovery period of 4 weeks.

ORGAN WEIGHTS: Relative mean liver weights in male rats exposed to 50 ppm were significantly increased compared to controls. In male rats exposed to 5 ppm DCPD for 13 weeks, the absolute mean and the relative mean kidney weights were decreased when compared to controls. These differences in organ weights disappeared during the recovery period.

HISTOPATHOLOGY: NON-NEOPLASTIC: Male rats exposed to 5 and 50 ppm DCPD accumulated hyaline droplets in the proximal convoluted tubular epithelial cells to a much greater extent than in control rats. This accumulation of hyaline droplets occurred as early as the end of two weeks of exposure and throughout the exposure period, but were not observed during the postexposure or recovery period. Males exposed to 1 ppm DCPD sacrificed after Week 6 had a higher incidence of hyaline droplets than at Week 13. Intraluminal protein was also observed in DCPD-treated male rats as early as Week 2. By Week 13, all male rats exposed to 50 ppm had tubular proteinosis. However, unlike the hyaline droplets, there was incomplete recovery during the postexposure period. Similar results were observed for the treatment-related increase in regenerative epithelium which increased in severity over the exposure period, lessening only slightly during the recovery period. During the postexposure period, the incidence of regenerative epithelium also increased in both exposed and nonexposed female rats. Other histologic changes observed in control and treated male rats included glomerular basement membrane thickening and interstitial nephritis, which increased in incidence during both the exposure and recovery period. Histological examination of other organs and tissues in rats did not reveal any treatment-related changes.

ELECTRON MICROSCOPY: Electron dense crystalline material within hyaline droplets from proximal tubular cells of DCPD-exposed male rats was seen. These structures were absent in proximal tubular cells of control males. After the 13-week recovery period, these electron dense structures were not observed in the proximal cells of rats from the high-dose group.

Any other information on results incl. tables:
Dicyclopentadiene produced kidney damage in male rats at all dose levels. There were epithelial cells excreted in the urine and alterations in kidney structure in the proximal tubule, such as an increase in the incidence of hyaline droplets, regenerative epithelium, and an accumulation of tubular proteinaceous material. From electron micrographs, many of the hyaline droplets in the exposed male rats appeared electron-dense and angular or crystalline-shaped. These kidney effects were not observed in any of the female rats and were not observed post exposure or at the end of the recovery period.
Incidence and Severity of Hyaline Droplets in Proximal Tubules of Male Rats Exposed to DCPD (Bevan et al 1992)

Week 6				Week 13				
Severity*	Control	1 ppm	5 ppm	50 ppm	Control	1 ppm	5 ppm	50 ppm
Mild	0/9	5/9	4/9	0/9	0/9	0/9	8/9	0/9
Moderate	0/9	2/9	1/9	6/9	0/9	0/9	0/9	3/9
Marked	0/9	0/9	0/9	1/9	0/9	0/9	0/9	6/9

* values represent the incidence of structural change at the respective degree of severity.

Conclusions: Subchronic exposure of rats to dicyclopentadiene for 13 weeks resulted in no systemic toxicity at 50 ppm. The only change observed was a male, rat specific nephropathy, that is characteristic of the hyaline droplet nephropathy produced by a diverse group of compounds. The NOAEC for males and females was reviewed by Bevan et al, 1992 and was concluded to be 5.1 ppm (27.6 mg/m3) for males (excluding the Hyaline droplet effect) and 51 ppm (276 mg/m3) for females.

Reliability: 1 (reliable without restriction)

Study 5

Data source: ECHA website - Exp Key Repeated dose toxicity: inhalation.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/6/3

Study reference:

Author not specified. Report, 1982.

Detailed study summary and results:

Groups of 45 male and 45 female B6C3F1 mice were exposed by inhalation, 6 hr/day, 5 days/week, for 13 weeks (64 exposures) to dicyclopentadiene vapour at concentrations of 0 (air control), 1, 5.1 or 51 ppm (analysed concentrations). Animals were sacrificed after 10, 30 and 64 inhalation exposures and post exposure sacrifices were made at 29 and 92 days following the last exposure. Clinical observations, body weights, blood clinical chemistry and haematology, ophthalmology, organ weights and histopathology evaluations were made during the study. A number of statistically significant alterations were noted in this study but the aetiology and association with dicyclopentadiene exposure are unclear. There were no overt signs of toxicity although approximately 20% of the mice of the 51 ppm exposure group died during the exposure period, primarily due to pulmonary congestion. The NOAEC is concluded to be 5.1 ppm (27.6 mg/m3).

Test type:

Test type: subchronic
Limit test: no
Test guideline: equivalent or similar to OECD Guideline 413 (Subchronic Inhalation Toxicity: 90-Day)
GLP compliance: yes

Test substance:

Name of test material (as cited in study report): dicyclopentadiene (DCPD)
CAS number: 77-73-6
Source: Exxon Chemical Company, Baton Rouge, LA, USA
Sample reference: BRRC 43-156
Physical state: clear, colourless liquid
Analytical purity: =95% endo-DCPD, 0.5% exo-DCPD
Impurities (identity and concentrations): several impurities of which only cyclopentadiene. and isoprene were present at =0.5%
Stability under test conditions: The composition remained stable throughout the study

Test animals:

Species: mouse
Strain: other: B6C3F1
Sex: male/female
No. of animals per sex per dose: 45

TEST ANIMALS
- Source: Charles River Breeding Laboratory (Portage, MI, USA)
- Age: 30-34 days
- Health assessment: confirmed following arrival
- Weight at study initiation: no data
- Housing: individually in stainless steel wire mesh suspended cages
- Diet: powdered NIH-07 diet ad libitum except during exposure
- Water: ad libitum except during exposure
- Acclimation period: no data

ENVIRONMENTAL CONDITIONS
- Temperature: 68-72°F non-exposure period
- Humidity: 40-60% non-exposure period
- Air changes (per hr): no data
- Photoperiod: 12 hrs dark / 12 hrs light

IN-LIFE DATES: July 1981 - January 1981

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air
Details on inhalation exposure: GENERATION OF TEST ATMOSPHERE / CHAMBER DESCRIPTION
- Exposure apparatus: Stainless steel rectangular (2mx2mx1m) exposure chamber with glass windows and door in front wall (total volume 4350 L).
- Method of holding animals in test chamber: individually in suspended stainless steel wire mesh cage with stainless steel pans between each layer of cages to prevent contamination. Cage positions were rotated routinely.

- System of generating particulates/aerosols: DCPD vapour was generated by heating the liquid in a Pyrex tube using a minimum amount of heat to prevent decomposition and formation of CPD. Filtered air was used to dilute the vapour prior to introduction into the chamber.
- Temperature and humidity in air chamber: 70-79°F, 39-68%
- Air flow rate: 2000 L/min

TEST ATMOSPHERE
- Brief description of analytical method used: Chamber concentrations were analysed at hourly intervals by gas chromatography/flame ionization detection.

Analytical verification of doses or concentrations: yes
Details on analytical verification of doses or concentrations: The chamber concentration of dicyclopentadiene was measured six times per day for each exposure group.

Duration of treatment / exposure: 13 weeks
Frequency of treatment: 6 hours/day, 5 days/week

Doses/concentrations: 0, 1, 5, 50 ppm
Basis: nominal conc.

Doses/concentrations: 1, 5.1, 51 ppm
Basis: analytical conc.

Doses/concentrations: 0, 5.4, 27.6, 276 mg/m3
Basis: analytical conc.

MMAD / GSD: Not applicable

No. of animals per sex per dose: 45
Control animals: yes

Details on study design:
Post-exposure observation periods of 4 and 13 wks.
9 mice/sex/dose were scheduled for sacrifice after 2, 6 and 13 wks of exposure and 4 and 13 wks post-exposure.

Examinations:
Observations and examinations performed and frequency:

CAGE SIDE OBSERVATIONS: Yes
- During exposure mice were observed several times through the chamber window.

DETAILED CLINICAL OBSERVATIONS: Yes
- Mice were observed for clinical signs before and after each exposure and daily during the recovery period.

BODY WEIGHT: Yes
- Recorded at study initiation, weekly during both the exposure period and the first 5 wks of the recover period, and then every 2 wks. Animals were also weighed before termination.

FOOD CONSUMPTION: No

OPHTHALMOSCOPIC EXAMINATION: Yes
- High dose mice received ophthalmoscopic examination before sacrifice

HAEMATOLOGY: Yes
- Haematology analyses were performed on all mice prior to sacrifice after 2, 6 and 13 wk exposure and 4 and 13 wk post-exposure with blood from the orbital sinus. Erythrocyte count, haemoglobin, haematocrit, mean corpuscular volume, mean corpuscular haemoglobin and concentration, and total/differential white blood cell counts were determined.

CLINICAL CHEMISTRY: Yes
- Serum chemistry analyses were performed on all mice prior to sacrifice after 2, 6 and 13 wk exposure and 4 and 13 wk post-exposure with blood from the orbital sinus. Serum was analyzed for creatinine, urea nitrogen, calcium, phosphrous, chloride, alanine aminotransferase, aspartate aminotransferase, total protein, albumin, total bilirubin, alkaline phosphatase, glucose and osmolality.

Sacrifice and pathology:
GROSS PATHOLOGY: Yes
- Necropsies were conducted on all mice.
- Kidneys, lungs, liver and testes were weighed.
- Adrenals, bone and bone marrow (sternum), brain, epididymides, eyes, heart, kidneys, larynx, liver, lungs, lymph nodes (mediastinal), muscle (gastrocnemeous), nasal turbinates, parathyroids, pituitary, sciatic nerve, spleen, testes, thymus, thyroids, trachea, urinary bladder and gross lesions were preserved for microscopic evaluation.

HISTOPATHOLOGY: Yes
- Organs were examined microscopically in control and high dose mice sacrificed after 13 wks of exposure.

Statistics:
Analysis of variance, Bartlett’s test, Duncan’s multiple range test, F-test, Student’s t-test, Cochran t-test (applied when appropriate).

Results:

Endpoint: NOAEC
Effect level: 5 ppm (nominal)
Sex: male/ female
Basis for effect level / Remarks: 27.6 mg/m3. Mortality (20%) occurred in the high-dose mice during the study

Results of examinations:
Clinical signs and mortality: yes
Body weight and weight gain: yes
Food consumption: not examined
Food efficiency: not examined
Water consumption: not examined
Ophthalmoscopic examination: no effects
Haematology: no effects
Clinical chemistry: no effects
Urinalysis: not examined
Neurobehaviour: not examined
Organ weights: no effects

Gross pathology: no effects
Histopathology: non-neoplastic: no effects
Histopathology: neoplastic: no effects

Details on results:
CLINICAL SIGNS AND MORTALITY
- Ten males and 9 female mice exposed to 51 ppm DCPD died during the study; no more than 2 mice died at any other level.
- No significant clinical signs or body wt changes were noted prior to death. The likely cause of death appeared to be pulmonary congestion and possibly renal failure. These effects were not seen in mice sacrificed at the end of the study.
- During exposure, a few of the mice at 51 and 5.1 ppm showed coordination loss and/or decreased activity.

BODY WEIGHT AND WEIGHT GAIN
- Males and females in the 51 ppm group showed significant elevation in body wt gain that returned to parity with control values during recovery

Any other information on results incl. tables:
A number of statistically significant alterations were noted in this study but the aetiology and association with dicyclopentadiene exposure are unclear. Approximately 20 percent of mice exposed to 51 ppm died during the exposure regimen. The cause of death was pulmonary congestion yet similar lung lesions were not found in animals terminated during the study. Also, female mice exposed to 51 ppm showed an increase in body weight during the last few weeks. A potential effect of dicyclopentadiene was seen in the female mice given 64 exposures to 51 or 5.1 ppm was a decrease in serum albumin indicative of slight liver dysfunction (7% difference from control); absolute and relative liver weights were also increased. No morphological changes were found to indicate any effect of dicyclopentadiene exposure. Thus any effect of dicyclopentadiene on the livers of female mice was considered to be minimal in severity.

Conclusions: Although there were no overt signs of toxicity due to dicylopentadiene, approximately 20% of mice died primarily as a result of pulmonary congestion. The aetiology and association with dicyclopentadiene exposure are unclear. The NOAEC is concluded to be 5.1 ppm (27.6 mg/m3).

Reliability: 1 (reliable without restriction)

Study 6

Data source: ECHA website - Exp Supporting Repeated dose toxicity: inhalation.003
Link:http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/7/6/3/?documentUUID=864bf1bb-4b82-411f-bbfd-cbbe74983184

Study reference:

Author not specified. Publication, 1971

Detailed study summary and results:

Groups of 12 male and 12 female Wistar rats were exposed by inhalation 7 hours/day, 5 days/week for 89 days to dicyclopentadiene vapour at concentrations of 0, 19.7, 35.2 or 73.8 ppm. One female rat given 73.8 ppm had convulsions for about 5 min immediately after the

exposure on day 19. Another female rat from the 19.7 ppm group had convulsions for 5 min upon removal from the chamber on day 45. No convulsions were observed among the 35.2 ppm rats. The 73.8 ppm concentration and, to a lesser degree, 35.2 ppm caused kidney effects such as round cell accumulations, dilated tubules, casts, and tubular degeneration; these kidney lesions were more frequent and of greater severity in the male than in the female rats.

There were chronic pneumonia and bronchiectasis were reported in 3 males in the 73.8 ppm group with none in the controls; this is not a statistically significant finding (but may suggest some lung involvement associated with repeated inhalation of DCPD at this concentration). Other pathologic changes in the lungs were sporadic and not dose-related.

No dose-related pathologic changes of note were found in the heart, spleen, adrenal, trachea, prostate, testis, colon, and mesentery of rats from any dose group. Protein concretions were noted in the urinary bladder of males of all treatment groups and in controls, but none was found in females.

Test type:

Test type: subchronic
Limit test: no
Test guideline: equivalent or similar to EPA OTS 798.2450 (90-Day Inhalation Toxicity)
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): Isomeric mixture of endo/exo DCPD in a 95:5 ratio
CAS number: 77-73-6
Physical state: Clear colourless liquid
Analytical purity: 96.7%
Molecular weight: 132.21
Boiling point at 100 mm Hg: 105°C
Specific gravity: 0.9816 at 20/20°C
Flash point (Tag upon cup): 150°F
Vapour pressure at 20°C, 1.4 mm
Melting point: 16-18°C

Test animals:

Species: rat
Strain: Wistar
Sex: male/female
No. of animals per sex per dose: 12

TEST ANIMALS
- Harlan Wistar
- Young adults
- 192-267 g (males); 149-205 g (females)
- No further details

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air
Details on inhalation exposure: no data

Analytical verification of doses or concentrations: yes
Details on analytical verification of doses or concentrations: Gas chromatography.

Duration of treatment: 89 days
Frequency of treatment: 7 hours/day, 5 days/week.

Doses/concentrations: 0, 19.7, 35.2 or 73.8 ppm
Basis: analytical conc.

Doses/concentrations: 0, 107, 190 and 399 mg/m3
Basis: analytical conc.

No. of animals per sex per dose: 12
Control animals: yes

Examinations:
Observations and examinations performed and frequency:

CLINICAL OBSERVATIONS: Yes
BODY WEIGHT: Yes
FOOD CONSUMPTION: No data
OPHTHALMOSCOPIC EXAMINATION: No data
HAEMATOLOGY: No data
CLINICAL CHEMISTRY: No data
URINALYSIS: No data

Sacrifice and pathology:
GROSS PATHOLOGY: Yes
HISTOPATHOLOGY: Yes. 20 tissue samples from the thoracic and abdominal cavities were taken from each rat for microscopic examination.
Other examinations: Liver and kidney weights were recorded.

Statistics:
Body weight changes and kidney and liver weight as % of body weight compared statistically by Bartlett homogeneity of variance, analysis of variance and the Duncan multiple range.

Results:

Endpoint: NOAEC
Effect level: < 19.7 ppm
Sex: male/ female
Basis for effect level / Remarks: one female exposed to 19.7 ppm had a 5 minute convulsion after 45 days exposure (the only potentially treatment-related effect at this concentration)

Results of examinations:
Clinical signs and mortality: yes

Body weight and weight gain: yes
Food consumption: not examined
Food efficiency: not examined
Water consumption: not examined
Ophthalmoscopic examination: not examined
Haematology: not examined
Clinical chemistry: not examined
Urinalysis: not examined
Neurobehaviour: not examined
Organ weights: no effects
Gross pathology: yes
Histopathology: non-neoplastic: yes
Histopathology: neoplastic: not examined

Details on results:
CLINICAL SIGNS AND MORTALITY: One female rat given 73.8 ppm had convulsions for about 5 min immediately after the exposure on day 19. Another female rat from the 19.7 ppm group had convulsions for 5 min upon removal from the chamber on day 45. No convulsions were observed among the 35.2 ppm rats. No additional signs attributable to exposure were observed for the remainder of the study.

BODY WEIGHT AND WEIGHT GAIN: The mean body weight gains of both sexes given 73.8 ppm were statistically significantly lower than those of the controls after 4 days, but no further significant weight gain differences were observed after days 13, 31, 55, 75, and 89.

ORGAN WEIGHTS: Mean kidney and liver weights and kidney and liver weights as % of bodyweight were statistically significantly increased in males compared to controls at all exposure concentrations (except liver at 35.2 ppm). Differences between treated and control male rats in body weight and organ: body weight ratios were not dose-related and were not observed in the female rats.

GROSS PATHOLOGY: The 73.8 ppm concentration and, to a lesser degree, 35.2 ppm caused kidney effects such as round cell accumulations, dilated tubules, casts, and tubular degeneration; these kidney lesions were more frequent and of greater severity in the male than in the female rats
HISTOPATHOLOGY: Chronic pneumonia and bronchiectasis were reported in 3 males in the 73.8 ppm group with none in the controls; this is not a statistically significant finding (but may suggest some lung involvement associated with repeated inhalation of DCPD at this concentration). Other pathologic changes in the lungs were sporadic and not dose-related.
No dose-related pathologic changes of note were found in the heart, spleen, adrenal, trachea, prostate, testis, colon, and mesentery of rats from any dose group. Protein concretions were noted in the urinary bladder of males of all treatment groups and in controls, but none was found in females.

Conclusions: The subchronic NOAEC of DCPD in rats was 19.7 - 35.2 ppm (107-190 mg/m3).

Reliability: 2 (reliable with restrictions)

Study 7

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 5.4 Repeated dose toxicity (c)
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

Kinkead, E.R. et al., Toxicol. Appl. Pharmacol., 20, 552 (1971)

Detailed study summary and results:

No significant signs of toxicity were seen during or after the exposure period.

Test type:

Test guideline: Unknown
GLP compliance: no data

Test substance:

Name of test material (as cited in study report): Dicyclopentadiene
CAS number: 77-73-6
Analytical purity: Unknown

Test animals:

Species: dog
Strain: Beagle
Sex: male
No. of animals per sex per dose: Unknown

Administration/exposure:

Route of administration: inhalation: vapour
Type of inhalation exposure: whole body
Vehicle: other: air
Details on inhalation exposure: no data

Analytical verification of doses or concentrations: unknown

Duration of treatment: 89 days
Frequency of treatment: 7 hours/day, 5 days/week.

Doses/concentrations: 0, 8.9, 23.5, 32.4 ppm
Basis: unknown

No. of animals per sex per dose: Unknown
Control animals: yes, concurrent vehicle

Examinations:
Observations and examinations performed and frequency:

CLINICAL OBSERVATIONS: Yes
BODY WEIGHT: No data
FOOD CONSUMPTION: No data
OPHTHALMOSCOPIC EXAMINATION: No data
HAEMATOLOGY: No data
CLINICAL CHEMISTRY: No data

URINALYSIS: No data

Results:

Endpoint: NOAEC
Effect level: 32.4 ppm
Sex: male

Results of examinations:
Clinical signs and mortality: No significant signs of toxicity were seen during or after the exposure period.
Body weight and weight gain: No data
Food consumption: No data
Food efficiency: No data
Water consumption: No data
Ophthalmoscopic examination: No data
Haematology: No data
Clinical chemistry: No data
Urinalysis: No data
Neurobehaviour: No data
Organ weights: No data
Gross pathology: No data
Histopathology: non-neoplastic: No data
Histopathology: neoplastic: No data

Conclusions: The NOAEL of DCPD in male dogs was 32.4 ppm.

Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Specific target organ toxicity (repeated exposure) - human data

No data available.

Specific target organ toxicity (repeated exposure) - other data

No data available.

3.11 Aspiration hazard

Study 1

Data source: HSDB: DICYCLOPENTADIENE – Chemical/Physical Properties. Viscosity
Link: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+77-73-6

Study reference:

U.S. Coast Guard, Department of Transportation. CHRIS - Hazardous Chemical Data. Volume II. Washington, D.C.: U.S. Government Printing Office, 1984-5.

Detailed study summary and results:

0.736 cP (est) at 70 deg F

Reliability: this information is taken from a reliable peer reviewed source: HSDB

Study 2

Data source: ECHA website – Exp Supporting Viscosity.002
Link:http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/4/23/?documentUUID=948d62f1-bcf1-4eb8-b17b-ab00daa5a903

Study reference:

Company data (2016).

Detailed study summary and results:

The viscosity of commercial DCPD (>80%) is 1-5 mPa.s at 20°C

Study 3

Data source: ECHA website – Exp Supporting Viscosity.001
Link:http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/4/23/?documentUUID=43bb3cf6-e1b2-4b6c-9f83-89e8a6af7794

Study reference:

Company data (2016).

Detailed study summary and results:

Guideline: according to ASTM 445

GLP compliance: no

The viscosity of commercial DCPD with purity of 94% is 4.384 mm^2/s at 20°C and 2.811 mm^2/s at 40°C.

4. ENVIRONMENTAL HAZARDS

4.1 Hazardous to the aquatic environment

4.1.1 Ready biodegradability (screening studies)

Study 1

Data source: ECHA website – Exp Supporting Biodegradation in water: screening tests.004
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/3/2

and

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 3.5 Biodegradation (a)
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

and

Data source: US EPA Screening-level hazard characterization Document, December 2010 – 2.2 Environmental Exposure and Fate, table 4
Link:http://www.epa.gov/chemrtk/hpvis/hazchar/Category_Resin%20Oils_December_2010.pdf

Study reference:

M.I.T.I. Test was performed in CITI, Japan. 1997 (as in OECD SIDS)

National Institute of Technology and Evaluation. 2002. Biodegradation and Bioaccumulation of the Existing Chemical Substances under the Chemical Substances Control Law. Available online at http://www.safe.nite.go.jp/english/kizon/KIZON_start_hazkizon.html as of October 4, 2010 . (as in US EPA Screening-level hazard characterization Document)

Detailed study summary and results:

This study was identified in OECD SIDS. The study was unavailable for review but considered adequate for assessment as it has already been through the regulatorty process. A study to show biodegradation in water for dicyclopentadiene was carried out using OECD guideline 301C. The results were 0% biodegradation in 2 weeks.

Test type:

Test type: ready biodegradability
Test guideline: according to OECD Guideline 301 C (Ready Biodegradability: Modified MITI Test (I))
GLP compliance: yes

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Dicyclopentadiene purity 99%

Materials and methods:

Oxygen conditions: aerobic
Inoculum or test system: no data
Details on inoculums: water
Duration of test (contact time): 2 wk
Initial test substance concentration: based on: no data
Parameter followed for biodegradation estimation: no data
Details on study design: not reported
Reference substance: no data

Results:

Preliminary study: not reported
Test performance: not reported
% Degradation of test substance: 0% after 2 weeks
Details on results: under test condition no biodegradation observed

Reliability: This data has been used in the OECD SIDS but the study was unavailable for review.

Study 2

Data source 1: ECHA website – NS NS Biodegradation in water: screening tests.006
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/3/2/?documentUUID=f3eb4462-17dc-43c6-8f7f-c6cb1deafce4

and

Data source 2: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 3.5 Biodegradation (b)
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

Spangoord, R.J. et a. (1979): NTIS Report No. AD AO 78236,|SRI International (contract no. DAMD 17-78-C-8053).

Detailed study summary and results:

% Degradation of test substance: 1.6% after 21 days

Test type:

Test guideline: No data
GLP compliance: No data

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
CAS number: 77-73-6
Purity: unknown

Materials and methods:

Inoculum or test system: other: other bacteria: from surface water, adapted
Initial test substance concentration: 5 mg/L based on test mat.
Parameter followed for biodegradation estimation: no data
Details on study design: not reported
Reference substance: no data

Results:

Preliminary study: not reported
Test performance: not reported
% Degradation of test substance: 1.6% after 21 days

Reliability: This data has been used in the OECD SIDS but the study was unavailable for review.

Study 3

Data source: ECHA website – Read across Subs Key Biodegradation in water: screening tests.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/3/2/?documentUUID=da8235f7-ee06-4828-b2ed-21975fb001e4

Study reference:

Author not specified. Report date 2004-04-18
Study result type: read-across from supporting substance (structural analogue or surrogate)
Study period: 30 January 2003 - 5 March 2003

Detailed study summary and results:

DCPD/Codimer Concentrate cannot be considerd readily biodegradable as the substance had biodegraded by 0% in 28 days.

Test type:

Test type: ready biodegradability
Test guideline: according to OECD Guideline 301 F (Ready Biodegradability: Manometric Respirometry Test) with the exception of the inoculum preparation which was performed ASTM D5864
Principles of method if other than guideline: Additional exceptions reported none which would affected the quality or integrity of the study data
GLP compliance: yes

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): no
CAS number: 68478-10-4
CAS Inventory Name: Naphtha, petroleum, light steam-cracked, debenzenized, C8-16 cycloalkadiene concentrate; DCPD/Codimer Concentrate is produced as a distillate from a C8+ fraction of thermally processed pyrolysis gasoline obtained from ethylene production (steam cracking process). The sample tested consisted of dicyclopentadiene (29%), methylcyclopentadiene dimer (13%), cyclopentadiene/methylcyclopentadiene codimer (13%), other codimers of cyclopentadiene - e.g. with 1,3-butadiene or isoprene (7%), other similar codimers of ethycyclopentadiene (22%), balance (16%).

Materials and methods:

Oxygen conditions: other:

Inoculum or test system: other: Activated Slude supernatant
Details on inoculum: activated sludge from the Clinton Sanitary Wastewater Treatment Plant, Annandale New Jersey
Duration of test (contact time): 28d
Parameter followed for biodegradation estimation: O2 consumption

Details on study design: Triplicate test systems were used to evaluate the iodegradability of the test and positive control substances at mean concentrations of 49.00 mg/L and 47.39 mg/L, respectively. Blank test systems, which did not contain the test or positive control substance, were run concurrently in triplicate. The total suspended solids (TSS) of the activated sludge was determined to be 4.41 g/L. The inoculum was added at a 1% loading volume of sludge supernatant to test medium. The microbial count of the inoculum was 106 CFU/mL. One liter of test medium, which was aerated for 24 hours with carbon dioxide free air, was added to each one liter respirometer flask. The test substance was weighed in an air tight syringe and injected into the test medium. The test system was sealed immediately after addition of the test substance. An aliquot of the positive control stock solution was added to the appropriate test flasks. An unacclimated activated sludge inoculum was used in this study. The inoculum was obtained from the Clinton Sanitary Wastewater Treatment Plant, Annandale, NJ, USA. The treatment plant receives domestic sewage. All test systems were placed on a Coordinated Environmental Services (CES) automated respirometer which automatically recorded the oxygen uptake in general agreement with the OECD guideline. The 28-day study was conducted at a temperature range of 21.0°C to 22.2°C.

Reference substance: other: Sodium Benzoate

Results:

% Degradation of test substance: 0% after 28 days
Parameter: O2 consumption

BOD5 / COD results
Results with reference substance: Sodium benzoate biodegraded to >60% by day 2 and the average of the cumulative oxygen consumed in the blank systems was 22.35 mg/l.

No measurable biodegradation observed over a 28 day testing period. DCPD/Codimer Concentrate cannot be considerd readily biodegradable.

Reliability: 2 (reliable with restrictions)

Study 4

Data source: ECHA website – QSAR Supporting Biodegradation in water: screening tests.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/3/2/?documentUUID=4a753e54-73ae-41bb-947b-b93092c8718d

Study reference:

Howard, P.H., Boethling, R.S., Stiteler, W.M., Meylan, W.M., Hueber, A.E., Beauman, J.A., and M.E. Larosche. Predictive model for aerobic biodegradability developed from a file of evaluated biodegradation data. 1992. Environ. Toxicol. Chem. 11: 593-603.

Detailed study summary and results:

The Biodegradation Probability Program (Biowin) estimates the probability for the rapid aerobic biodegradation of an organic chemical in the presence of mixed populations of environmental microorganisms. Estimates are based upon fragment constants that were developed using multiple linear and non-linear regression analyses.
The results of the BIOWIN 1, 2, 3, 5 and 6 predictions are that 3a,4,7,7a-tetrahydro-4,7-methanoindene is not readily biodegradable.

Test type:

Test type: QSAR calculation
Test guideline: not applicable
Principles of method if other than guideline: Biowin v4.1 in EPISuite 4 (2009). The Biodegradation Probability Program (Biowin) estimates the probability for the rapid aerobic biodegradation of an organic chemical in the presence of mixed populations of environmental microorganisms. Estimates are based upon fragment constants that were developed using multiple linear and non-linear regression analyses.
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
CAS number: 77-73-6

Materials and methods:

Oxygen conditions: Not applicable
Inoculum or test system: Not applicable
Details on study design: Not applicable
Reference substance: Not applicable

Results:

Biowin 5 and 6 models contain the most molecular fragment predictors that are relevant to 3a,4,7,7a-tetrahydro-4,7-methanoindene (4 x alkenyl hydrogen, 2 x -CH2- [cyclic] and 4 x -CH - [cyclic]. The results of Biowin 1,2,3 and 4 are based on the molecular mass and equation constants for 3a,4,7,7a-tetrahydro-4,7-methanoindene. Biowin 1-2 predict a probability of between 0.75 and 0.76 for ready biodegradability. Biowin 3 predicts a probability of 2.91 (weeks-months) for ultimate biodegradability. Biowin 5 predicts a probability of 0.4328 for ready biodegradability. Biowin 6 predicts a probability of 0.2276 for ready biodegradability

BOD5 / COD results
Results with reference substance: Not applicable
Any other information on results incl. tables: Biowin1 (Linear Model Prediction): Biodegrades Fast, Biowin2 (Non-Linear Model Prediction): Biodegrades Fast, Biowin3 (Ultimate Biodegradation Timeframe): weeks-months, Biowin4 (Primary Biodegradation Timeframe): Days-weeks, Biowin5 (MITI Linear Model Prediction): Does Not Degrade fast, Biowin6 (MITI Non-Linear Model Prediction): Does Not Degrade Fast, Ready Biodegradability Prediction: No

Conclusions: The use of a QSAR to predict the biodegradability of 3a,4,7,7a-tetrahydro-4,7-methanoindene is an appropriate technique to use. The use of Biowin 5 and 6 is appropriate for 3a,4,7,7a-tetrahydro-4,7-methanoindene as this compound falls within the applicability domain of the model.

The results of the BIOWIN 1, 2, 3, 5 and 6 predictions are that 3a,4,7,7a-tetrahydro-4,7-methanoindene is not readily biodegradable.

Reliability: 2 (reliable with restrictions)

Study 5

Data source: ECHA website – QSAR Supporting Biodegradation in water: screening tests.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/3/2/?documentUUID=10285184-c71f-474b-b048-950014fc8d2b

Study reference:

Howard, P.H., W.M., Meylan, Aronson, D., Stiteler,W.M., Tunkel, J., Comber, M. and Parkerton, F.
A New Biodegradation Prediction Model Specific to Petroleum Hydrocarbons. 2005. Environ. Toxicol. Chem. 24(8): 1847-1860.

Detailed study summary and results:

The results of the BioHCwin predictions for 3a,4,7,7a-tetrahydro-4,7-methanoindene indicate that it will degrade, with an estimated half life of 21.4 days.

Test type:

Test type: QSAR calculation
Test guideline: not applicable
Principles of method if other than guideline: BioCHwin v1.01 in EPISuite 4 (2009). BioHCwin is a predictive model for determining quantitative primary biodegradation half-lives for individual petroleum hydrocarbons. This model uses a fragment-based approach that is similar to several other biodegradation models, such as those within the Biodegradation Probability Program (Biowin) estimation program. A half-life in days is estimated using a multiple linear regression against counts of 31 distinct molecular fragments. The model was developed using a data set consisting of 175 compounds with environmentally-relevant experimental data that was divided into training and validation sets.
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
CAS number: 77-73-6

Materials and methods:

Oxygen conditions: aerobic
Inoculum or test system: Not applicable
Details on study design: Not applicable
Reference substance: Not applicable

Results:

% Degradation of test substance: 50% in 21.4 days
Remark: Predicted on the basis of the presence of an alkenyl hydeogen and cyclic hydrogen functional groups.

Conclusions: The results of the BioHCwin predictions for 3a,4,7,7a-tetrahydro-4,7-methanoindene indicate that it will degrade, with an estimated half life of 21.4 days.

Reliability: 2 (reliable with restrictions)

4.1.2 BOD_5/COD

Study 1

Data source: ECHA website – NS NS Biodegradation in water: screening tests.005
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/3/2/?documentUUID=e0686955-2cbc-4ea7-bdcd-bf4728520dcb

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene.

Detailed study summary and results:

BOD5/ThOD =< 4 %

BOD5

COD

BOD5*100/COD

Test type:

No data

4.1.3 Aquatic simulation tests

No data available.

4.1.4 Other degradability studies

Study 1

Data source: ECHA website – QSAR Key Phototransformation in air.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/2/2/?documentUUID=45b6ee7c-6f32-45a4-98f7-9422d0d23994

Study reference:

Publication: Atkinson, R. Kinetics and mechanisms of the gas-phase reactions of the hydroxyl radical with organic compounds under atmospheric conditions, 1985, Chem. Rev. 85: 69-201

Detailed study summary and results:

The overall OH rate constant was calculated to be 119.1993E-12 cm³ molecule-1 s-1. Half life is calculated based on this rate constant and a hydroxyl radical concentration of 1.5 E+6 molecule.cm-3

Test type:

Principles of method if other than guideline: The estimation methods used by AOPWIN are based upon the structure-activity relationship (SAR) methods developed by Dr. Roger Atkinson and co-workers. AOPWIN incorporates updated fragment and reaction values as cited in Kwok and Atkinson (1995).
GLP compliance: no data

Degradation rate constant:
Reaction with: OH radicals
Rate constant: 0.000000001 cm³ molecule-1 s-1

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes

Materials and methods:

Estimation method (if used): Measured data from author and other investigators were quality assessed and then used to develop rate constants for different chemicals. The author applied a least squares analysis of degradation rate constants to calculate a preferred value.

Light source: no data

Results:

OVERALL OH Rate Constant = 119.1993 E-12 cm^3/molecule-sec
HALF-LIFE = 0.090 Days (12-hr day; 1.5E6 OH/cm^3)
HALF-LIFE = 1.077 Hrs
OVERALL OZONE Rate Constant = 40.000000 E-17 cm^3/molecule-sec
HALF-LIFE = 0.029 Days (at 7E11 mol/cm^3)
HALF-LIFE = 41.256 Min

Reliability: 2 (reliable with restrictions)

Study 2

Data source: ECHA website – NS Disregarded Phototransformation in air.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/2/2/?documentUUID=6847f824-ddf0-4cbc-9829-5bef88ced7ff

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene.

Detailed study summary and results:

Degradation in % (for indirect photolysis): > 50 after 0.1 day(s)

Test type:

IniIdentity of test material same as for substance defined in section 1 (if not read-across): yes
CAS number: 77-73-6
Details on test conditions: Sensitiser (for indirect photolysis): O3

Study 3

Data source: ECHA website – NS Disregarded Phototransformation in air.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/2/2/?documentUUID=13122287-a79f-4505-a6d7-83805755e387

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene.

Detailed study summary and results:

Degradation in % (for indirect photolysis): > 50 after 0.1 day(s)

Test type:

IniIdentity of test material same as for substance defined in section 1 (if not read-across): yes
CAS number: 77-73-6
Details on test conditions: Sensitiser (for indirect photolysis): OH

4.1.5 Bioaccumulation test on fish

Study 1

Data source: ECHA website – Exp Key Bioaccumulation: aquatic/sediment.001
Link:http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/4/2/?documentUUID=791c683c-fc47-4baf-9d08-7ed938443112

Study reference:

Review article or handbook dated 1976.

Detailed study summary and results:

Bluegill exposed to 1.0 mg/l 14C-DCPD durign bioconcentration study appeared normal, fed readily and generally showed no signs of stress due to chemical toxicity. Mean measured concentratio of 14 C-DCPD in the water through 14 days of exposure was 0.98 ± 0.25 mg/l. Estimated BCF for bluegill exposed to 14C-DCPD is 53. Report states "it appears that the potential of DCPD to bioconcentrate is slight"

Test type:

Test guideline: equivalent or similar to OECD Guideline 305 (Bioconcentration: Flow-through Fish Test)
Deviations: yes slightly lower test temperature, design
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Radiolabelling: yes
Details on test material: Clear liquids contained in sealed screw-cap vials from Litton Bionetics Inc. Correspondence which accompanied these vials identified their contents as: uniformly ring-labeled 14 C-DCPD 100 µCi (50 µL).

Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Details on sampling: Water and bluegill were sampled from the units after 1, 2, 4, 7, 10 and 14 days of exposure. During the depuration period, fish were sampled 1,3 and 7 days after transfer. Duplicate 5ml water samples were taken directly from both units on all sample days during the exposure period. Each sample was pipetted from the test unit into a glass vial containing 15ml of counting solution. At each sampling interval 3 fish were removed from each unit, eviscerated, and the distribution of 14C-residues in the edible potion invetigated radiometric analysis. Each portion of the muscle tissue from each fish sampled was air dried for approximately 24 hrs in a combusion cone at 21 degrees C. Each dired sample was combusted in aPackard Model 306 Tri-Carb Sample Oxidizer. Resulting 14 C)2 was trapped as a carbonate ina mixture of Carbosorb (1M hyamine hydroxide in methanol) and scintillator cocktain (4 g, 98% PPO + 2% bis-MSB/liter toluene) in counting vial. Prior to analyses of a set of tissue samples, oxidizer unit cleaned by consecutively burning two pressed paper discs to elininate any residual 14 C-activity.

Vehicle: yes
Details on preparation of test solutions or sediment: The contents of the vial containing 14C-DCPD and an additional 236mg of unlabelled DCPD were quantitatively transferred to a 1-liter volumetric flask and diluted to volume with distilled water. To determine the specific activity three 1ml aliquots of the superstock solution were transferred to glass vials containing 15ml of counting solution. These vials were placed in the liquid scintillation spectrometer and the mean specific activity was measured to be 6.46±0.55 dpm/µg, equivalent to 69% of the theoretical concentration. Stock solutions were prepared from the superstock solutions and were mixed in acetone. The mechanical dilution apparatus was used to establish and maintain desired chemical concentration.

Test organisms (species): Lepomis macrochirus
Details on test organisms: fish in all units fed a dry pelleted ration ad libitum each day. Mean and standard deviation (N=30) wet weight of 1.75 + 0.65 g and standard length of 36.1 +

5.5 mm obtained from commercial fish farmer in Connecticut and were held in these conditions for 30 days prior to initiation of study.

Route of exposure: aqueous
Test type: flow-through
Water media type: freshwater
Total exposure / uptake duration: 14 d
Total depuration duration: 7 d

Test conditions:
Hardness: 35 mg/L as Ca Co3
Test temperature: 18 + 1.0 degrees C
pH: 7.1
Dissolved oxygen: greater than (>) 60% of saturation
TOC: data not reported
Salinity: not applicable
Nominal and measured concentrations: mean measured concentration - Day 0 = 0.77, day 1=1.44, day 2 = 0.70, day 4= 0.91, day 7 = 0.87, day 10=1.08, day 14= 1.11 mg/l. Overall mean = 0.98mg/l.

Details on test conditions: Studies were conducted using a modification of a proportional dilution apparatus which provided for the automatic, intermittent introduction of the test material and dilutent water into the test chamber. Three 30 liter experimental units were utilised in the system. 50 bluegill wre placed into each of the three experimental units. Flow rate of 5 l/hr. Bluegill in one unit were exposed to 150mg/l of 14C-DIMP, those in the second unit were exposed to 1.00mg/l 14C-DCPD, and the thrid unit served as control.
Reference substance (positive control): no
Details on estimation of bioconcentration: Radiometric analysis indicate that the mean measured concentration of 14C-residue was 50.73±6.43 mg/kg and was calculated for the period of apparent equilibrium (days 2-4).

Results:

Bioaccumulation factor:
Conc. in environment / dose: 0.98 mg/l
Type: BCF
Value: 53
Basis: edible fraction
Time of plateau: 2 d

Depuration:
Elimination: yes
Endpoint: DT50
Depuration time (DT): 7 d

Kinetic parameters: After 24 hours in clean water residues in the edible portions had reduced to below the limit of detection, <5mg/kg.

Metabolites: data not reported

Results with reference substance (positive control): not applicable

Details on results: bluegill exposed to 1.0 mg/l 14C-DCPD during bioconcentration study appeared normal, fed readily and generally showed no signs of stress due to chemical toxicity. Mean measured concentratio of 14 C-DCPD in the water through 14 days of exposure was .98 ± 0.25 mg/l. Estimated BCF for bluegill exposed to 14C-DCPD is 53X. Report states " it appears that the potential of DCPD to bioconcentrate is slight"

Reported statistics: BCF reported to be 53 no other statistic was reported.

Validity criteria fulfilled: yes

Conclusions: A BCF of 53 was reported in Bluegill for DCPD.

Reliability: 2 (reliable with restrictions)

Study 2

Data source 1: ECHA website – Exp Supporting Bioaccumulation: aquatic/sediment.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/4/2/?documentUUID=9419f06f-4677-4b2d-bfab-183a05fce0ce

Data source 2: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 3.7 Bioaccumulation
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

MITI, Japan (1997). Test was performed by CITI, Japan.

Detailed study summary and results:

BCF ranged from 58.9 -384

Test type:

Test guideline: according to OECD Guideline 305 C (Bioaccumulation: Test for the Degree of Bioconcentration in Fish)
Deviations: no data
GLP compliance: yes

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Dicyclopentadiene 99% purity
Details on properties of test surrogate or analogue material: not reported

Materials and methods:

Details on sampling: not reported

Details on preparation of test solutions or sediment: not reported

Test organisms (species): Cyprinus carpio

Details on test organisms: not reported

Route of exposure: not reported
Test type: flow-through
Water media type: no data

Test conditions:
Hardness: not reported
Test temperature: 25 Degs C
pH: not reported
Dissolved oxygen: not reported
TOC: not reported
Salinity: not reported
Nominal and measured concentrations: 1) 0.3mg/l (2) 0.03mg/l

Details on test conditions: not reported
Reference substance (positive control): no data
Details on estimation of bioconcentration: not reported

Results:

Bioaccumulation factor:
Conc. in environment / dose: 0.3 mg/l
Type: BCF
Value: 112-330 other: not reported
Basis: no data
Calculation basis: other: not reported

Conc. in environment / dose: 0.03 mg/l
Type: BCF
Value: 58.9 - 384 other: not reported
Basis: no data
Calculation basis: other: not reported

Any other information on results incl. tables: BCF reported: Concentration (1) 0.3 mg/l BCF (1) 112 -330; concentration (2) 0.03mg/l BCF (2) 58.9 -384
Validity criteria fulfilled: no data

Conclusions: BCF ranged from 58.9 -384

Reliability: 4 (not assignable)

Study 3

Data source: ECHA website – NS Disregarded Bioaccumulation: aquatic/sediment.005
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/5/4/2/?documentUUID=302ce481-916c-49a1-abda-0d1a8350c4c6

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene

Detailed study summary and results:

BCF = 53

Test type:

Test guideline: Unknown
GLP compliance: no data

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes

Materials and methods:

Details on sampling: not reported

Details on preparation of test solutions or sediment: not reported

Test organisms (species): Lepomis macrochirus
Details on test organisms: not reported

Route of exposure: not reported
Total exposure/uptake duration: 96h

Nominal and measured concentrations: 1 mg/l

Details on test conditions: not reported
Reference substance (positive control): no data
Details on estimation of bioconcentration: not reported

Results:

Bioaccumulation factor:
Conc. in environment / dose: 1 mg/l
Type: BCF
Value: 53
Basis: no data
Calculation basis: other: not reported

4.1.6 Bioaccumulation test with other organisms

No data available.

4.1.7 Short-term toxicity to fish

Study 1

Data source: ECHA website – Exp WoE Short-term toxicity to fish.005

Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=378e5033-9b7f-4e33-81ea-cea56985bc62

Study reference:

Author not specified. Publication, 1976

Detailed study summary and results:

This is a 96 hr LC50 study, non GLP, similar to standard guidelines, experimental study, notable restrictions in design and/or reporting but contributing to weight of evidence assessment. 96 hr LC50 Ictalurus punctatus 15.7 mg/l.

Test type:

Test guideline: equivalent or similar to Macroinvertebrate and fish toxicity tests followed the recommended bioassay procedures as described in the "Methods for Acute Toxicity Tests with Fish, Macro invertebrates, and Amphibians" (US EPA 1975).
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Clear liquid from Aldrich Chemical Company Milwaukee, Wisconsin. 95% active ingredient basis.
Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Analytical monitoring: yes
Details on sampling: Dissolved oxygen contration, pH and temperature of test solutions were checked at 0, 48 and 96 hrs in 2 selected test concentrations at a minimum.
Details on test solutions: stock solutions were prepared in a solution of reagent-grade acetone.. stock solution for fish ration of 1.5 parts DCPD : 98.5 parts acetone (volume:volume). Negative controls, consisting of the same dilution water and conditions as test concentrations but no DCPD.

Test organisms (species): Ictalurus punctatus
Details on test organisms: Study reviewed more than one test species: mean wet weight of bluegill was 1.1g, mean wet weight of channel catfish was 1.3 g, mean wet weight of fathead minnow was 1.4g, mean wet weight of rainbow trout was 1.6 g

Test type: static
Water media type: freshwater
Total exposure duration: 96 h
Post exposure observation period: not reported

Test conditions:
Hardness: not reported
Test temperature: 12 ± 1.0°C = rainbow trout, 21 ±1.0°C = bluegill, 21 ± 1.0 °C = channel catfish, 21 ± 1.0 °C = fathead minnow,
pH 6.9-7.3

Dissolved oxygen: 8.8-3.8 mg/l
Salinity: not reported
Nominal and measured concentrations: nominal concentrations: bluegill: 32.0, 28.0, 24.0, 18.0, 14.0, Channel Catfish 32.0,24.0,18.0,16.0,14.0, fathead minnow 56.0, 42.0, 32.0, 24.0, 18.0.; Rainbow Trout 42.0, 32.0, 24.0, 18.0, 14.0, 10.0 all plus Contol (acetone), control.

Details on test conditions: Static fish bioassays were conductd in 19.6 liter glass vessels hed in contact temperature water baths at 21 +- 1.0 degrees C for the bluegill, channel catfish, and fathead minnow and at 14 +- 1.- Degrees C for the rainbow trout. The standard diluents (well water) used had the same water quality characteristics as that for holding water.100 mg/l was the highest concentration of DCPD tested

Results:

Effect concentrations
Duration: 96 h
Endpoint: LC50
Effect conc.: 15.7 mg/L
Nominal/Measured: nominal
Conc. based on: no data
Basis for effect: no data

Details on results: Reported as median lethal concentration

Results with reference substance (positive control): not reported
Reported statistics and error estimates: 95% confidence levels

Conclusions: 96 hr LC50 Ictalurus punctatus 15.7 mg/l. Study, non GLP, similar to standard guidelines, experimental study, notable restrictions in design and/or reporting but contributing to weight of evidence assessment

Reliability: 2 (reliable with restrictions)

Study 2

Data source: ECHA website – Exp WoE Short-term toxicity to fish.008
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=19223361-ddf2-492a-a74e-c9eba8d43c5e

Study reference:

Author not specified. Publication, 1976

Detailed study summary and results:

This is a 96 hr LC50 Lepomis macrochirus 23.3 mg/l. study, non GLP, similar to standard guidelines, experimental study, notable restrictions in design and/or reporting but contributing to weight of evidence assessment

Test type:

Test guideline: equivalent or similar to Macroinvertebrate and fish toxicity tests followed the recommended bioassay procedures as described in the "Methods for Acute Toxicity Tests with Fish, Macro invertebrates, and Amphibians" (US EPA 1975).
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Clear liquid from Aldrich Chemical Company Milwaukee, Wisconsin. 95% active ingredient basis.
Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Analytical monitoring: yes
Details on sampling: Dissolved oxygen contration, pH and temperature of test solutions were checked at 0, 48 and 96 hrs in 2 selected test concentrations at a minimum.
Details on test solutions: stock solutions were prepared in a solution of reagent-grade acetone.. stock solution for fish ration of 1.5 parts DCPD: 98.5 parts acetone (volume:volume). Negative controls, consisting of the same dilution water and conditions as test concentrations but no DCPD

Test organisms (species): Lepomis macrochirus
Details on test organisms: Study reviewed more than one test species: mean wet weight of bluegill was 1.1g, mean wet weight of channel catfish was 1.3 g, mean wet weight of fathead minnow was 1.4g, mean wet weight of rainbow trout was 1.6 g

Test type: static
Water media type: freshwater
Total exposure duration: 96 h
Post exposure observation period: not reported

Test conditions:
Hardness: not reported
Test temperature: 12 ± 1.0°C = rainbow trout, 21 ±1.0°C = bluegill, 21 ± 1.0 °C = channel catfish, 21 ± 1.0 °C = fathead minnow,
pH 6.9-7.3
Dissolved oxygen: 8.8-3.8 mg/l
Salinity: not reported
Nominal and measured concentrations: bluegill: 32.0, 28.0, 24.0, 18.0, 14.0, Channel Catfish 32.0,24.0,18.0,16.0,14.0, fathead minnow 56.0, 42.0, 32.0, 24.0, 18.0.; Rainbow Trout 42.0, 32.0, 24.0, 18.0, 14.0, 10.0 all plus Contol (acetone), control.

Details on test conditions: Static fish bioassays were conductd in 19.6 liter glass vessels hed in contact temperature water baths at 21 +- 1.0 degrees C for the bluegill, channel catfish, and fathead minnow and at 14 +- 1.- Degrees C for the rainbow trout. The standard diluents (well water) used had the same water quality characteristics as that for holding water.100 mg/l was the highest concentration of DCPD tested

Results:

Effect concentrations
Duration: 96 h

Endpoint: LC50
Effect conc.: 23.3 mg/L
Nominal/Measured: nominal
Conc. based on: no data
Basis for effect: no data

Details on results: Reported as median lethal concentration

Results with reference substance (positive control): not reported
Reported statistics and error estimates: 95% confidence levels

Conclusions: 96 hr LC50 Lepomis macrochirus 23.3 mg/l. study, non GLP, similar to standard guidelines, experimental study, notable restrictions in design and/or reporting but contributing to weight of evidence assessment

Reliability: 2 (reliable with restrictions)

Study 3

Data source: ECHA website – Exp WoE Short-term toxicity to fish.010
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=dcb6b2a2-a223-4f9e-9125-750f88738540

Study reference:

Author not specified. Publication, 1976

Detailed study summary and results:

This is a 96 hr LC50 study, non GLP, similar to standard guidelines, experimental study, notable restrictions in design and/or reporting but contributing to weight of evidence assessment. 96 hr LC50 Salmo gairdneri (new name: Oncorhynchus mykiss) 15.9 mg/l

Test type:

Test guideline: equivalent or similar to Macroinvertebrate and fish toxicity tests followed the recommended bioassay procedures as described in the "Methods for Acute Toxicity Tests with Fish, Macro invertebrates, and Amphibians" (US EPA 1975).
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Clear liquid from Aldrich Chemical Company Milwaukee, Wisconsin. 95% active ingredient basis.
Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Analytical monitoring: yes

Details on sampling: Dissolved oxygen contration, pH and temperature of test solutions were checked at 0, 48 and 96 hrs in 2 selected test concentrations at a minimum.
Details on test solutions: stock solutions were prepared in a solution of reagent-grade acetone.. stock solution for fish ration of 1.5 parts DCPD : 98.5 parts acetone (volume:volume). Negative controls, consisting of the same dilution water and conditions as test concentrations but no DCPD

Test organisms (species): Salmo gairdneri (new name: Oncorhynchus mykiss)
Details on test organisms: Study reviewed more than one test species: mean wet weight of bluegill was 1.1g, mean wet weight of channel catfish was 1.3 g, mean wet weight of fathead minnow was 1.4g, mean wet weight of rainbow trout was 1.6 g

Test type: static
Water media type: freshwater
Total exposure duration: 96 h
Post exposure observation period: not reported

Test conditions:
Hardness: not reported
Test temperature: 12 ± 1.0°C = rainbow trout, 21 ±1.0°C = bluegill, 21 ± 1.0 °C = channel catfish, 21 ± 1.0 °C = fathead minnow,
pH 6.9-7.3
Dissolved oxygen: 8.8-3.8 mg/l
Salinity: not reported
Nominal and measured concentrations: nominal concentrations: bluegill: 32.0, 28.0, 24.0, 18.0, 14.0, Channel Catfish 32.0,24.0,18.0,16.0,14.0, fathead minnow 56.0, 42.0, 32.0, 24.0, 18.0.; Rainbow Trout 42.0, 32.0, 24.0, 18.0, 14.0, 10.0 all plus Contol (acetone), control.

Details on test conditions: Static fish bioassays were conductd in 19.6 liter glass vessels hed in contact temperature water baths at 21 +- 1.0 degrees C for the bluegill, channel catfish, and fathead minnow and at 14 +- 1.- Degrees C for the rainbow trout. The standard diluents (well water) used had the same water quality characteristics as that for holding water.100 mg/l was the highest concentration of DCPD tested

Results:

Effect concentrations
Duration: 96 h
Endpoint: LC50
Effect conc.: 15.9 mg/L
Nominal/Measured: nominal
Conc. based on: no data
Basis for effect: no data

Details on results: Reported as median lethal concentration

Results with reference substance (positive control): not reported
Reported statistics and error estimates: 95% confidence levels

Conclusions: 96 hr LC50 Salmo gairdneri (new name: Oncorhynchus mykiss) 15.9 mg/l. Study, non GLP, similar to standard guidelines, experimental study, notable restrictions in design and/or reporting but contributing to weight of evidence assessment

Reliability: 2 (reliable with restrictions)

Study 4

Data source: ECHA website – Exp WoE Short-term toxicity to fish.007
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=3bf7661d-95b2-4c05-b4a2-7b7c2f9874f0

Study reference:

Author not specified. Publication, 1976

Detailed study summary and results:

This is a 96 hr LC50 study, non GLP, similar to standard guidelines, experimental study, notable restrictions in design and/or reporting 96 hr LC50 Pimephales promelas 31.1 mg/l. but contributing to weight of evidence assessment

Test type:

Test guideline: equivalent or similar to Macroinvertebrate and fish toxicity tests followed the recommended bioassay procedures as described in the "Methods for Acute Toxicity Tests with Fish, Macro invertebrates, and Amphibians" (US EPA 1975).
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Clear liquid from Aldrich Chemical Company Milwaukee, Wisconsin. 95% active ingredient basis.
Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Analytical monitoring: yes
Details on sampling: Dissolved oxygen contration, pH and temperature of test solutions were checked at 0, 48 and 96 hrs in 2 selected test concentrations at a minimum.
Details on test solutions: stock solutions were prepared in a solution of reagent-grade acetone.. stock solution for fish ration of 1.5 parts DCPD: 98.5 parts acetone (volume:volume). Negative controls, consisting of the same dilution water and conditions as test concentrations but no DCPD

Test organisms (species): Pimephales promelas
Details on test organisms: Study reviewed more than one test species: mean wet weight of bluegill was 1.1g, mean wet weight of channel catfish was 1.3 g, mean wet weight of fathead minnow was 1.4g, mean wet weight of rainbow trout was 1.6 g

Test type: static
Water media type: freshwater
Total exposure duration: 96 h

Post exposure observation period: not reported

Test conditions:
Hardness: not reported
Test temperature: 12 ± 1.0°C = rainbow trout, 21 ±1.0°C = bluegill, 21 ± 1.0 °C = channel catfish, 21 ± 1.0 °C = fathead minnow,
pH 6.9-7.3
Dissolved oxygen: 8.8-3.8 mg/l
Salinity: not reported
Nominal and measured concentrations: nominal concentrations: bluegill: 32.0, 28.0, 24.0, 18.0, 14.0, Channel Catfish 32.0,24.0,18.0,16.0,14.0, fathead minnow 56.0, 42.0, 32.0, 24.0, 18.0.; Rainbow Trout 42.0, 32.0, 24.0, 18.0, 14.0, 10.0 all plus Contol (acetone), control.

Details on test conditions: Static fish bioassays were conductd in 19.6 liter glass vessels hed in contact temperature water baths at 21 +- 1.0 degrees C for the bluegill, channel catfish, and fathead minnow and at 14 +- 1.- Degrees C for the rainbow trout. The standard diluents (well water) used had the same water quality characteristics as that for holding water.100 mg/l was the highest concentration of DCPD tested.

Results:

Effect concentrations
Duration: 96 h
Endpoint: LC50
Effect conc.: 31.1 mg/L
Nominal/Measured: nominal
Conc. based on: no data
Basis for effect: no data

Details on results: Reported as median lethal concentration

Results with reference substance (positive control): not reported
Reported statistics and error estimates: 95% confidence levels

Conclusions: 96 hr LC50 Pimephales promelas 31.1 mg/l. Study, non GLP, similar to standard guidelines, experimental study, notable restrictions in design and/or reporting but contributing to weight of evidence assessment.

Reliability: 2 (reliable with restrictions)

Study 5

Data source: ECHA website – Exp WoE Short-term toxicity to fish.006
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=c0ee0e98-7473-474f-9d58-14a25bb76c06

and

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 4.1 Acute/prolonged toxicity to fish (a)
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

Environment Agency of JAPAN (1995)

Detailed study summary and results:

The 96 hr LC50 to Oryzias latipes (himedaka) was 4.3 mg/l

Test type:

Test guideline: according to OECD Guideline 203 (Fish, Acute Toxicity Test)
GLP compliance: no data

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: not reported.
Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Analytical monitoring: no data
Details on sampling: not reported
Details on test solutions: 1.8,3.2,5.6,10 and 18 mg/l DMSO & HCO-40 (4:1 weight ratio, 300 mg/l)

Test organisms (species): Oryzias latipes
Details on test organisms: not reported

Test type: semi-static
Water media type: no data
Total exposure duration: 96 h
Post exposure observation period: not reported

Test conditions:
Hardness: not reported
Test temperature: not reported
pH: not reported
Dissolved oxygen: not reported
Salinity: not reported
Nominal and measured concentrations: nominal 1.8, 3.2, 5.6, 10,18 mg/l
Details on test conditions: group of 10 fish exposed to nominal concentrations, control and laboratory water control

Results:

Effect concentrations
Duration: 96 h
Endpoint: LC50
Effect conc.: 4.3 mg/L
Nominal/Measured: nominal
Conc. based on: no data

Basis for effect: no data
Remarks (e.g. 95% CL): 95% confidence level of 3.1 mg/l to 5.8 mg/l

Duration: 24 h
Endpoint: LC50
Effect conc.: 11 mg/L
Nominal/Measured: nominal
Conc. based on: no data
Basis for effect: no data

Duration: 48 h
Endpoint: LC50
Effect conc.: 6.7 mg/L
Nominal/Measured: nominal
Conc. based on: no data
Basis for effect: no data

Duration: 72 h
Endpoint: LC50
Effect conc.: 6.7 mg/L
Nominal/Measured: nominal
Conc. based on: no data
Basis for effect: no data

Details on results: no other data

Results with reference substance (positive control): not reported
Reported statistics and error estimates: 95% confidence level of 3.1 mg/l to 5.8 mg/l on LC50 (96h)

Conclusions: The 96 hr LC50 to Oryzias latipes (himedaka) was 4.3 mg/l

Reliability: This study has been used in the OECD SIDS but it is unavailable for review

Study 6

Data source: ECHA website – NS Disregarded Short-term toxicity to fish.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=6942057c-54ce-432a-b05f-0507939de14c

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene.

Detailed study summary and results:

The 96 hr LC50 to Salmo gairdneri (new name: Oncorhynchus mykiss) was 16 mg/l

Test type:

Method: Unknown.

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: not reported.
Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Test organisms (species): Salmo gairdneri (new name: Oncorhynchus mykiss)
Details on test organisms: not reported

Results:

Effect concentrations
Duration: 96 h
Endpoint: LC50
Effect conc.: 16 mg/L

Conclusions: The 96 hr LC50 to Salmo gairdneri (new name: Oncorhynchus mykiss) was 16 mg/l

Study 7

Data source: ECHA website – NS Disregarded Short-term toxicity to fish.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=26f49d42-4706-4903-b2db-80ec4ea08337

and

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 4.1 Acute/prolonged toxicity to fish (b)
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene.

Detailed study summary and results:

The 96 hr LC50 to Ictalurus punctatus was 16 mg/l

Test type:

Method: Unknown.

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: not reported.
Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Test organisms (species): Ictalurus punctatus
Details on test organisms: not reported

Results:

Effect concentrations
Duration: 96 h
Endpoint: LC50
Effect conc.: 16 mg/L

Conclusions: The 96 hr LC50 to Ictalurus punctatus was 16 mg/l

Study 8

Data source: ECHA website – NS Disregarded Short-term toxicity to fish.009
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=b44c8179-ea27-44d9-aecd-cedd1f4de3f7

Study reference:

Spangoord, R.J. et a. (1979): NTIS Report No. AD AO 78236,|SRI International (contract no. DAMD 17-78-C-8053).

Detailed study summary and results:

The 48 hr LC50 to Oryzias latipes was 25 mg/l

Test type:

Method: Unknown

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: not reported.
Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Test organisms (species): Oryzias latipes
Details on test organisms: not reported

Results:

Effect concentrations
Duration: 48 h
Endpoint: LC50
Effect conc.: 25 mg/L

Conclusions: The 48 hr LC50 to Oryzias latipes was 25 mg/l

Study 9

Data source: ECHA website – NS Disregarded Short-term toxicity to fish.004
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=0d78d600-d767-4854-980e-9f62dd6b63b4

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene

Detailed study summary and results:

The 96 hr LC50 to Lepomis macrochirus was 23 mg/l

Test type:

Method: other: Keine Angaben

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: not reported.
Details on properties of test surrogate or analogue material: not applicable

Materials and methods:

Test organisms (species): Lepomis macrochirus
Details on test organisms: not reported

Results:

Effect concentrations
Duration: 96 h
Endpoint: LC50
Effect conc.: 23 mg/L

Conclusions: The 96 hr LC50 to Lepomis macrochirus was 23 mg/l

Study 10

Data source: ECHA website – QSAR WoE Short-term toxicity to fish.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/2/?documentUUID=5944f0c1-3c20-4453-9cca-1726c32df9d3

Study reference:

(Q)SAR calculation. Ecosar v1.00. Nabholz V and Mayo-Bean K. 2009
Bibliographic source: US Environmental Protection Agency

Detailed study summary and results:

An estimated value has been produced for this endpoint which provides weight of evidence for the toxicity of the substance to fish. The estimated 96 hr LC50 for fish is 9.765 mg/L

Test type:

Principles of method if other than guideline: The Ecosar class program has been developed primarily for the evaluation of neutral organic compounds and organic classes with excess toxicity. The QSARs in the Ecosar program are developed for chemical classes based on measured test data that have been submitted by industry or they are developed by other sources for chemicals with similar structures, e.g., phenols. Using the measured aquatic toxicity values and estimated Kow values, regression equations can be developed for a class of chemicals. Toxicity values for new chemicals may then be calculated by inserting the estimated Kow into the regression equation and correcting the resultant value for the molecular weight of the compound.

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes

Materials and methods:

Test organisms (species): fish
Water media type: freshwater
Total exposure duration: 96h

Results:

Effect concentrations
Duration: 96 h
Endpoint: LC50
Effect conc.: 9.765 mg/L
Nominal / measured: estimated
Conc. based on: test mat.
Basis for effect: mortality

Conclusions: The estimated 96 hr LC50 for fish is 9.765 mg/L

4.1.8 Short-term toxicity to aquatic invertebrates

Study 1

Data source: ECHA website – Exp Key Short-term toxicity to aquatic invertebrates.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/4/?documentUUID=01619727-9fa7-4452-8704-5f20ba02c9b9

Study reference:

Author not specified. Report date 1995-06-18

Detailed study summary and results:

The study identified a 48h median effective concentration (EC50) of DCPD 92% to Daphnia Magna. This was calculated to be 0.62 mg/l with 95% confidence limits of 0.52-0.72 mg/l. The no observed effect concentration was 0.22 mg/l. The test material was prepared as a solvent stock solution, though the concentration and stability of the test material was not determined. The test included both untreated and solvent controls. As the volatilisation of the substance is not expected to be critical, based on the low vapour pressure, the reporting of the results as nominal concentrations was considered to be adequate.

Test type:

Test guideline: according to OECD Guideline 202 (Daphnia sp. Acute Immobilisation Test)
GLP compliance: yes

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: DCPD 92%, clear colourless liquid. Test material prepared as solvent stock solution. 400mg of test material dissolved in 10ml dimethylformamide containing 1% (v/v) Tween 80. 200 ul of this stock soltuion dispersed in reconstituted water and volume adjusted to 2 litres to give test concentration of 4.0 mg/l. authors state "determination of the concentration and stability of the test material in the test solutions were not a requirement of the study plan".
Details on properties of test surrogate or analogue material: Not Applicable

Materials and methods:

Analytical monitoring: yes
Details on sampling: Water temperature recorded dialy, pH an oxygen concentration recorded at 0 adn 48 hrs.
Vehicle: no data
Details on test solutions: Test concentrations: 0.040mg/l, 0.071 mg/l, 0.13 mg/l, 0.22 mg/l, 0.40 mg/l, 0.71 mg/l, 1.3 mg/l, 2.2 mg/l, 4.0 mg/l untreated control solvent control (100 ul/l 1% (V/V) Tween 80 in dimethylformamide. Duplicate test vessels each containing 10 daphnids

Test organisms (species): Daphnia magna
Details on test organisms: maintained as lab culture originating from a strain supplied by Institut National de Recherche Chimique Appliquee France. First instar Daphnia used for testing

Test type: static
Water media type: no data
Limit test: yes
Total exposure duration: 48 h
Post exposure observation period: not reported

Test conditions:
Hardness: 270 mg/l as CaCO3
Test temperature: 21 degrees C
pH: 7.7 (adjusted if necessary with NaOH or HCl)
Dissolved oxygen: reconsititued water aerated until dissolved oxygen concentration was approx air-saturation value
Salinity: not reported
Nominal and measured concentrations: nominal concentrations
Details on test conditions: Range finding study then main study 20 daphnids (2 replicates of 10) exposed to aqueous solution of test material. Number of immobilised Daphnia recorded after 24 and 48 hrs
Reference substance (positive control): no

Results:

Effect concentrations
Duration: 48 h
Endpoint: EC50
Effect conc.: 0.62 mg/L
Nominal/Measured: nominal
Conc. based on: test mat.
Basis for effect: mobility
Remarks (e.g. 95% CL): 95% confidence limits of 0.53-0.72 mg/l

Duration: 48 h
Endpoint: NOEC
Effect conc.: 0.22 mg/L
Nominal/Measured: nominal
Conc. based on: test mat.
Basis for effect: mobility
Remarks (e.g. 95% CL): Authors state No observed effect concentration was 0.22 mg/l

Details on results: With a Vapour pressure of 1.3 volatilisation of the substance at 21 degrees C is not considered to be substantial. Nominal concentrations are therefore adequate.

Results with reference substance: not reported
Reported statistics and error estimates: 95% confidence limits
Validity criteria fulfilled: yes

Conclusions: 48h median effective concentration (EC50) of DCPD 92% to Daphnia Magna calculated to be 0.62 mg/l with 95% confidence limits of 0.52-0.72 mg/l. The no observed effect concentration was 0.22 mg/l

Reliability: 2 (reliable with restrictions)

Study 2

Data source: ECHA website – Exp Supporting Short-term toxicity to aquatic invertebrates.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/4/?documentUUID=8311237b-cfd7-4181-97cb-98424eae5a1d

Study reference:

Publication: Passino-Reader DR, Hickey JP, Ogilvie LM/ Toxicity to Daphnia pulex and QSAR Predictions for Polycyclic Hydrocarbons Representatvie of Great Lakes Contaminants, Bull. Environ. Contam. Toxicol (1997) 59:834-840

Detailed study summary and results:

Based on a nominal concentration this study provides an endpoint value for toxicity to invertebrates Daphnia Pulex of 4.2 mg/L. The study has been conducted according to ASTM guidelines but has notable restrictions in design and/or reporting.

Test type:

Test guideline: according to ASTM (1980) E728-80
Deviations: no data
GLP compliance: no data

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Chemicals in the study purchased from Aldrich Milwaukee, Wisconsin, Fluka Ronkonkoma New York, Lancaster Synthesis Windham New Hampshire, Pfalz and Bauer Waterbury Connecticut and Wiley Organics Coshocton Ohio. Purity range 94 to > 99%

Materials and methods:

Analytical monitoring: no
Details on test solutions: Nominal concentration
Test organisms (species): Daphnia pulex
Details on test organisms: from long-term cultures at the Great Lakes Science Center. Authors state reared and cultured to ASTM (1980). Neonates <24 h old. Not fed

Test type: no data
Water media type: freshwater
Total exposure duration: 48 h
Post exposure observation period: not reported

Test conditions:
Hardness: 160-200 mg/l as CaCO3; alkalinity = 120-125 mg/L as CaCO3
Test temperature: 20 Degrees C
Dissolved oxygen: 8-9 mg/l
Salinity: not reported
Details on test conditions: Solvent control (0.5 mL/L acetone and 5 toxicant concentrations in a geometric progresion). Range finding tests conducted. 3 valid bioassays were obtained.

Results:

Effect concentrations
Duration: 48 h
Endpoint: EC50
Effect conc.: 4.2 mg/L

Nominal/Measured: nominal

Conclusions: Based on a nominal concentration this study provides an endpoint value for toxicity to invertebrates Daphnia Pulex of 4.2 mg/L. The study has been conducted according to ASTM guidelines but has notable restrictions in design and/or reporting.

Reliability: 2 (reliable with restrictions)

Study 3

Data source: ECHA website – Exp Supporting Short-term toxicity to aquatic invertebrates.006
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/4/?documentUUID=c11cbea3-7d06-4f8a-9aeb-5a0ba01ccd64

and

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 4.2 Acute toxicity to aquatic invertebrates
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

Environment Agency of JAPAN (1997)

Detailed study summary and results:

The 48 hour EC50 is 8 mg/l

Test type:

Test guideline: according to OECD Guideline 202 (Daphnia sp. Acute Immobilisation Test)
Deviations: no data
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: 94.9% purity

Materials and methods:

Analytical monitoring: no data
Details on sampling: no data reporting
Vehicle: no data
Details on test solutions: No data reported

Test organisms (species): Daphnia magna
Details on test organisms: No data reported
Test type: semi-static
Water media type: freshwater
Limit test: no

Total exposure duration: 48 h
Post exposure observation period: No data reported

Test conditions:
Hardness: No data reported
Test temperature: No data reported
pH: No data reported
Dissolved oxygen: No data reported
Salinity: not reported
Nominal and measured concentrations: Test organisms were exposed to nominal concentrations of 1.8, 3.2, 5.6, 10 and 18 mg/l, to solubilizer (DMSO: HCO-40 = 4:1 weight ratio, 300 mg/l) control and laboratory water control.
Details on test conditions: 20 daphnids (4 replicates: 5 organisms per replicate) were exposed.

Results:

Effect concentrations
Duration: 48 h
Endpoint: EC50
Effect conc.: 8 mg/L
Nominal/Measured: nominal
Conc. based on: test mat.
Basis for effect: mobility
Remarks (e.g. 95% CL): 6.8-9.5

Duration: 24 h
Endpoint: EC50
Effect conc.: 8.6 mg/L
Nominal/Measured: nominal
Conc. based on: test mat.
Basis for effect: mobility

Duration: 48 h
Endpoint: NOEC
Effect conc.: < 1.8 mg/L
Nominal/Measured: nominal
Conc. based on: test mat.
Basis for effect: mobility

Conclusions: The 48 hour EC50 is 8mg/l.

Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Study 4

Data source: ECHA website – NS Disregarded Short-term toxicity to aquatic invertebrates.007
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/4/?documentUUID=a8d94d09-ac48-4ab9-94a4-2900a97d6858

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene

Detailed study summary and results:

The 48 hour EC50 Daphnia magna is 11 mg/l

Test type:

Test guideline: method unknown
Deviations: no data
GLP compliance: no data

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes

Materials and methods:

Test organisms (species): Daphnia magna

Results:

Effect concentrations
Duration: 48 h
Endpoint: EC50
Effect conc.: 11 mg/L

Conclusions: The 48 hour EC50 is 11 mg/l.

Study 5

Data source: ECHA website – NS Disregarded Short-term toxicity to aquatic invertebrates.004
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/4/?documentUUID=4547f912-67df-4d8a-b0f4-1ea9e3fdaab8

Study reference:

Yoshioka, Y. et al. (1986): Ecotoxicol. Environ. Safety 12,|15- 21

Detailed study summary and results:

The 3 hour LC50 is 40 mg/l

Test type:

Test guideline: Unknown
GLP compliance: no data

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes

Materials and methods:

Test organisms (species): other aquatic arthropod:

Results:

Effect concentrations
Duration: 3 h
Endpoint: LC50
Effect conc.: 40 mg/L

Conclusions: The 3 hour LC50 is 40 mg/l

Study 6

Data source: ECHA website – QSAR Supporting Short-term toxicity to aquatic invertebrates.005
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/4/?documentUUID=b18a6218-c49b-47a3-8767-44ce3f62ddbd

Study reference:

Computer programme US Environmental Protection Agency, Nabholz V and Mayo-Bean K, Ecosar v1.00, 2009

Detailed study summary and results:

The estimated 48 hr LC50 for Daphnia is 6.444 mg/l

Test type:

Principles of method if other than guideline: The Ecosar class program has been developed primarily for the evaluation of neutral organic compounds and organic classes with excess toxicity. The QSARs in the Ecosar program are developed for chemical classes based on measured test data that have been submitted by industry or they are developed by other sources for chemicals with similar structures, e.g., phenols. Using the measured aquatic toxicity values and estimated Kow values, regression equations can be developed for a class of chemicals. Toxicity values for new chemicals may then be calculated by inserting the estimated Kow into the regression equation and correcting the resultant value for the molecular weight of the compound.
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes

Materials and methods:

Test organisms (species): Daphnia magna
Test type: no data
Water media type: freshwater
Total exposure duration: 48 h

Results:

Effect concentrations
Duration: 48 h
Endpoint: LC50
Effect conc.: 6.444 mg/L
Conc. based on: QSAR
Basis for effect: no data

Conclusions: The estimated 48 hr LC50 for Daphnia is 6.444 mg/l

Reliability: 2 (reliable with restrictions)

4.1.9 Algal growth inhibition tests

Study 1

Data source: ECHA website – Exp WoE Toxicity to aquatic algae and cyanobacteria.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/6/?documentUUID=d14727a4-9c3c-4cfb-86fc-fbfde9f3a77b

Study reference:

Author not specified. Publication, 1976

Detailed study summary and results:

This is a non-GLP, Data near guideline study notable limitations in design and/or reporting but contributing to weight of evidence assessment which provides an EC50 toxicity value 96h for algae 22 mg/L

Test type:

Test guideline: equivalent or similar to Phytoplankton assay procedures followed the Algal Assay Procedure: Bottle Test (US EA 1971)
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Clear liquid from Aldrich Chemical Company Milwaukee, Wisconsin. 95% active ingredient basis.

Materials and methods:

Details on sampling: in vivo chlorophyll a content was determined at 24,48 and 96hrs of exposure and cell numbers at 96hrs as compared to controls
Details on test solutions: stock solutions prepared in a solution of reagent-grade acetone. The stock solutions prepared in the ratio of 1 part DCPD:99 parts acetone (volume:volume)

Test organisms (species): Anabaena flos-aquae
Details on test organisms: Study look at more than one species: Microcystis aeruginosa and Anabeana flos-aquae; Selenastrum capricornutum; Navicula pelliculosa. Obtained from algae collection at the University of Indiana, Bloomington , Indiciana and the Pacific Northwest Water Quality Laboratory (EPA) Corvallis Oregon. Authors state Cultures maintained according to the methods outlined in the Algal Assay Procedure: Bottle Test (US EPA 1971).

Test type: static
Water media type: freshwater
Total exposure duration: 96h

Test conditions:
Test temperature: 21±1.0°C
pH = 8.0-8.4
Nominal and measured concentrations: Nominal concentrations: 10, 16, 25, 40, 56, 63, 79 and 100mg/l. Concentrations of acetone tested were 100 and 1000mg/l.

Results:

Effect concentrations
Duration: 96 h
Endpoint: EC50
Effect conc.: 22 mg/L

Conclusions: This is a non-GLP, Data near guideline study notable limitations in design and/or reporting but contributing to weight of evidence assessment which provides an EC50 toxicity value for algae 22 mg/L

Reliability: 2 (reliable with restrictions)

Study 2

Data source: ECHA website – Exp WoE Toxicity to aquatic algae and cyanobacteria.006
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/6/?documentUUID=125af9c5-d8aa-4cbe-b509-644b469035e5

Study reference:

Author not specified. Publication, 1976

Detailed study summary and results:

This is a non-GLP, Data near guideline study notable limitations in design and/or reporting but contributing to weight of evidence assessment which provides an EC50 toxicity value 96h for algae 31 mg/L

Test type:

Test guideline: equivalent or similar to Phytoplankton assay procedures followed the Algal Assay Procedure: Bottle Test (US EA 1971)
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across):yes
Details on test material: Clear liquid from Aldrich Chemical Company Milwaukee, Wisconsin. 95% active ingredient basis.

Materials and methods:

Details on sampling: in vivo chlorophyll a content was determined at 24,48 and 96hrs of exposure and cell numbers at 96hrs as compared to controls
Details on test solutions: stock solutions prepared in a solution of reagent-grade acetone. The stock solutions prepared in the ratio of 1 part DCPD:99 parts acetone (volume:volume)

Test organisms (species): Microcystis aeruginosa
Details on test organisms: Microcystis aeruginosa and Anabeana flos-aquae; Selenastrum capricornutum; Navicula pelliculosa. Obtained from algae collection at the University of Indiana, Bloomington , Indiciana and the Pacific Northwest Water Quality Laboratory (EPA) Corvallis Oregon. Authors state Cultures maintained according to the methods outlined in the Algal Assay Procedure: Bottle Test (US EPA 1971).
Test type: static
Water media type: freshwater
Total exposure duration: 96h

Test conditions:
Test temperature: 21±1.0°C
pH = 8.0-8.4
Nominal and measured concentrations: Nominal concentrations: 10, 16, 25, 40, 56, 63, 79 and 100mg/l . Concentrations of acetone tested were 100 and 1000mg/l.

Results:

Effect concentrations
Duration: 96 h
Endpoint: EC50
Effect conc.: 31 mg/L

Conclusions: This is a non-GLP, Data near guideline study notable limitations in design and/or reporting but contributing to weight of evidence assessment which provides an EC50 toxicity value for algae 31 mg/L

Reliability: 2 (reliable with restrictions)

Study 3

Data source: ECHA website – Exp WoE Toxicity to aquatic algae and cyanobacteria.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/6/?documentUUID=0e69f318-6150-4378-9b2b-34b8f6341b3a

Study reference:

Author not specified. Publication, 1976

Detailed study summary and results:

This is a non-GLP, Data near guideline study notable limitations in design and/or reporting but contributing to weight of evidence assessment which provides an EC50 toxicity value 96h for algae > 100 mg/L

Test type:

Test guideline: equivalent or similar to Phytoplankton assay procedures followed the Algal Assay Procedure: Bottle Test (US EA 1971)
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across):yes
Details on test material: Clear liquid from Aldrich Chemical Company Milwaukee, Wisconsin. 95% active ingredient basis.

Materials and methods:

Details on sampling: in vivo chlorophyll a content was determined at 24,48 and 96hrs of exposure and cell numbers at 96hrs as compared to controls
Details on test solutions: stock solutions prepared in a solution of reagent-grade acetone. The stock solutions prepared in the ratio of 1 part DCPD:99 parts acetone (volume:volume)

Test organisms (species): Selenastrum capricornutum (new name: Pseudokirchnerella subcapitata)
Details on test organisms: Study look at more than one species: Microcystis aeruginosa and Anabeana flos-aquae; Selenastrum capricornutum; Navicula pelliculosa. Obtained from algae collection at the University of Indiana, Bloomington , Indiciana and the Pacific Northwest Water Quality Laboratory (EPA) Corvallis Oregon. Authors state Cultures maintained according to the methods outlined in the Algal Assay Procedure: Bottle Test (US EPA 1971).
Test type: static
Water media type: freshwater
Total exposure duration: 96h

Test conditions:
Test temperature: 21±1.0°C
pH = 8.0-8.4
Nominal and measured concentrations: Nominal concentrations: 10, 16, 25, 40, 56, 63, 79 and 100mg/l . Concentrations of acetone tested were 100 and 1000mg/l.

Results:

Effect concentrations
Duration: 96 h
Endpoint: EC50
Effect conc.: > 100 mg/L

Conclusions: This is a non-GLP, Data near guideline study notable limitations in design and/or reporting but contributing to weight of evidence assessment which provides an EC50 toxicity value for algae > 100 mg/L

Reliability: 2 (reliable with restrictions)

Study 4

Data source: ECHA website – Exp WoE Toxicity to aquatic algae and cyanobacteria.004
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/6/?documentUUID=8bfad33c-fb1a-4cdb-957f-c49a262dcf89

and
Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 4.3 Toxicity to aquatic plants
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

Study reference:

Environment Agency of JAPAN (1995)

Detailed study summary and results:

The 72 hour EC50 (growth rate) was 27mg/l and a NOEC of 18 mg/l was reported

Test type:

Test guideline: according to OECD Guideline 201 (Alga, Growth Inhibition Test)
GLP compliance: no

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across):yes
Details on test material: 94.9% purity

Materials and methods:

Analytical monitoring: yes
Details on sampling: not reported
Vehicle: yes
Details on test solutions: 5 nominal concentrations (10,18, 32.4, 58.3 and 105 mg/l_. Minimal amount of Tqween 80 - acetone (1:1) or DMSO HCO- 40 (9:1) is used as solubilizer

Test organisms (species): Selenastrum capricornutum (new name: Pseudokirchnerella subcapitata)
Details on test organisms: ATCC 22662
Test type: static
Water media type: no data
Limit test: yes
Total exposure duration: 72h
Post exposure observation period: not reported

Test conditions:

Test temperature: not reported
pH not reported
Nominal and measured concentrations: 5 nominal concentrations 10,18, 32.4, 58.3 and 105 mg/l

Results:

Effect concentrations
Duration: 72 h
Endpoint: EC50
Effect conc.: 27 mg/L
Nominal/Measured: meas. (not specified)
Conc. based on: no data
Basis for effect: no data

Effect concentrations
Duration: 72 h
Endpoint: NOEC
Effect conc.: 18 mg/L
Nominal/Measured: meas. (not specified)
Conc. based on: no data
Basis for effect: no data

Conclusions: The 72 hour EC50 (growth rate) was 27mg/l and a NOEC of 18 mg/l was reported

Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Study 5

Data source: ECHA website – NS Disregarded Toxicity to aquatic algae and cyanobacteria.005
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/6/?documentUUID=89bada47-5ca4-40a0-b0ee-d2d265b07a3d

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene.

Detailed study summary and results:

Study provides an LC50 toxicity value for Anabaena flos-aquae 22 mg/L (96h)

Test type:

Method: other: Unknown.

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes

Materials and methods:

Test organisms (species): Anabaena flos-aquae

Results:

Effect concentrations
Duration: 96 h
Endpoint: LC50
Effect conc.: 22 mg/L

Conclusions: Study provides an LC50 toxicity value for Anabaena flos-aquae 22 mg/L (96h)

Study 6

Data source: ECHA website – NS Disregarded Toxicity to aquatic algae and cyanobacteria.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/6/?documentUUID=7dc4559f-be34-48d1-a6fb-bf7263cb363e

Study reference:

ECETOC Bericht No. 19, Dicyclopentadiene.

Detailed study summary and results:

Study provides an EC50 toxicity value for Selenastrum capricornutum (new name: Pseudokirchnerella subcapitata) ›100 mg/L (96h)

Test type:

Method: other: Unknown.

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across): yes

Materials and methods:

Test organisms (species): Selenastrum capricornutum (new name: Pseudokirchnerella subcapitata)

Results:

Effect concentrations
Duration: 96 h
Endpoint: EC50
Effect conc.: ›100 mg/L

Conclusions: Study provides an EC50 toxicity value for Selenastrum capricornutum (new name: Pseudokirchnerella subcapitata) ›100 mg/L (96h)

Study 7

Data source: ECHA website – QSAR WoE Toxicity to aquatic algae and cyanobacteria.007
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/6/?documentUUID=55a910b9-9dc1-4be8-9cbe-93c88ab816c3

Study reference:

US Environmental Protection Agency, computer programme, Nabholz V and Mayo-Bean K, Ecosar v1.00, 2009

Detailed study summary and results:

Estimated 96 hour EC50 for Green Algae is 7.175 mg/L and the ChV is 2.387 mg/L, which corresponds to a NOEC of 1.688 mg/L.

Test type:

Principles of method if other than guideline: The Ecosar class program has been developed primarily for the evaluation of neutral organic compounds and organic classes with excess toxicity. The QSARs in the Ecosar program are developed for chemical classes based on measured test data that have been submitted by industry or they are developed by other sources for chemicals with similar structures, e.g., phenols. Using the measured aquatic toxicity values and estimated Kow values, regression equations can be developed for a class of chemicals. Toxicity values for new chemicals may then be calculated by inserting the estimated Kow into the regression equation and correcting the resultant value for the molecular weight of the compound.

Test substance:

Identity of test material same as for substance defined in section 1 (if not read-across):yes
CAS number:
77-73-6
SMILES: C(C(C=CC12)C1)(C2C=C3)C3
CHEM: 4,7-Methano-1H-indene, 3a,4,7,7a-tetrahydro-

Materials and methods:

Test organisms (species): Green Algae
Water media type: freshwater
Total exposure duration: 96h
Details on test conditions:
Log Kow: 3.165 (EPISuite Kowwin v1.68 Estimate)
Wat Sol: 83.14 (mg/L, EPISuite WSKowwin v1.43 Estimate)

Results:

Effect concentrations
Duration: 96 h
Endpoint: EC50
Effect conc.: 7.175 mg/L

Nominal/Measured: estimated
Conc. based on: test mat.

Effect concentrations
Duration: 96 h
Endpoint: other: ChV
Effect conc.: 2.387 mg/L
Nominal/Measured: estimated
Conc. based on: test mat.

Effect concentrations
Duration: 96 h
Endpoint: NOEC
Effect conc.: 1.688 mg/L
Nominal/Measured: estimated
Conc. based on: test mat.
Remarks (e.g. 95% CL): Calculated from ChV

Details on results: When divided by v2 (to adjust for ChV being a geometric mean of NOEC and LOEC), the ChV value corresponds to long-term algae NOEC of 1.688 mg/L.

Conclusions: Estimated 96 hour EC50 for Green Algae is 7.175 mg/L and the ChV is 2.387 mg/L, which corresponds to a NOEC of 1.688 mg/L.

Reliability: 2 (reliable with restrictions)

4.1.10 *Lemna* sp. growth inhibition test

No data available.

4.1.11 Fish early-life stage (FELS) toxicity test

No data available.

4.1.12 Fish short-term toxicity test on embryo and sac-fry stages

No data available.

4.1.13 Aquatic Toxicity – Fish, juvenile growth test

No data available.

4.1.14 Chronic toxicity to fish

Study 1

Data source: ECHA website – Exp WoE Long-term toxicity to fish.002
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/3/?documentUUID=89d05737-e156-43e4-9903-01ed35de0235

Study reference:

Author not specified. Review article or handbook dated 1976

Detailed study summary and results:

No effect concentration of 0.98±0.25 mg/l was reported in the study. As this was the highest tested concentration, in the bioaccumulation study we are not able to determine whether this is an actual NOEC.

Test type:

Test guideline: equivalent or similar to OECD Guideline 204 (Fish, Prolonged Toxicity Test: 14-day Study)
Deviations: yes Length of fish, temperature, water hardness, design
GLP compliance: no data

Test substance

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Clear liquid received from Litton Bionetics Inc. Uniformly ring-labelled 14C-DCPD, 50µl.

Materials and methods:

Analytical monitoring: yes
Details on sampling: Water and bluegill were sampled from the units after 1, 2, 4, 7, 10 and 14 days of exposure. During the depuration period, fish were sampled 1,3 and 7 days after transfer. Duplicate 5ml water samples were taken directly from both units on all sample days during the exposure period. Each sample was pipetted from the test unit into a glass vial containing 15ml of counting solution. At each sampling interval 3 fish were removed from each unit, eviscerated, and the distribution of 14C-residues in the edible potion invetigated.
Vehicle: yes
Details on test solutions: The contents of the vial containing 14C-DCPD and an additional 236mg of unlabelled DCPD were quantitatively transferred to a 1-liter volumetric flask and diluted to volume with distilled water. To determine the specific activity three 1ml aliquots of the superstock solution were transferred to glass vials containing 15ml of counting solution. These vials were placed in the liquid scintillation spectrometer and the mean specific activity was measured to be 6.46±0.55 dpm/µg, equivalent to 69% of the theoretical concentration. Stock solutions were prepared from the superstock solutions and were mixed in acetone. The mechanical dilution apparatus was used to establish and maintain desired chemical concentration.

Test organisms (species): Lepomis macrochirus

Details on test organisms: Obtained from a commercial fish hatchery in Conneticut and had a mean and standard deviation (N=30) wet weight of 1.75±0.65g and standard length of 36.1±5.5 mm. Fish in all units were fed a dry pelleted ration ad libitum each day. Fish remaining in the test units after 14 days were transferred to clean flowing water for 7 days. 30day acclimation

Test type: flow-through
Water media type: freshwater
Limit test: yes
Total exposure duration: 14d
Post exposure observation period: 7 day depuration period

Test conditions:
Hardness: 35 mg/l as CaCO3
Test temperature: 18±1.0°C
pH: 7.1
Dissolved oxygen: >60% of saturation
Salinity: not applicable
Nominal and measured concentrations: mean measured concentration - Day 0 = 0.77, day 1=1.44, day 2 = 0.70, day 4= 0.91, day 7 = 0.87, day 10=1.08, day 14= 1.11 mg/l
Details on test conditions: Studies were conducted using a modification of a proportional dilution apparatus which provided for the automatic, intermittent introduction of the test material and dilutent water into the test chamber. Three 30 liter experimental units were utilised in the system. 50 bluegill wre placed into each of the three experimental units. Flow rate of 5 l/hr. Bluegill in one unit were exposed to 150mg/l of 14C-DIMP, those in the second unit were exposed to 1.00mg/l 14C-DCPD, and the thrid unit served as control.
Reference substance (positive control): no

Results:

Effect concentrations
Duration: 14d
Endpoint: NOEC
Effect conc.: 0.98 mg/L
Nominal/Measured: meas. (not specified)
Conc. based on: test mat.
Basis for effect: mortality
Remarks (e.g. 95% CL) 0.98±0.25

Details on results: bluegill exposed to 1.00mg/l 14C-DCPD during bioconcentration study appeared normal, fed readily and generally showed no signs of stress due to chemical toxicity.This study was performed in order to assess bioaccumulation potential. However, the author states that no adverse effects were seen at 0.98±0.25 mg/l.

Conclusions: No effect concentration of 0.98±0.25 mg/l was reported in the study. As this was the highest tested concentration, in the bioaccumulation study we are not able to determine whether this is an actual NOEC.

Reliability: 2 (reliable with restrictions)

Study 2

Data source: ECHA website – QSAR WoE Long-term toxicity to fish.001
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/3/?documentUUID=14956749-5d5a-4655-981b-9bf5e795e448

Study reference:

ECOWIN v1 ECOSAR Classes for Microsoft Windows. Nabholz V and Mayo-Bean K. 2009 Computer model. USEPA OPPT Risk Assessment Division

Detailed study summary and results:

The estimated ChV value of 1.084 mg/L corresponds to long-term fish NOEC of 0.767 mg/L.

Test type:

Principles of method if other than guideline: The ECOSAR class program has been developed primarily for the evaluation of neutral organic compounds and organic classes with excess toxicity. The QSARs in the ECOSAR program are developed for chemical classes based on measured test data that have been submitted by industry or they are developed by other sources for chemicals with similar structures, e.g. phenols. Using the measured aquatic toxicity values and estimated Kow values, regression equations can be developed for a class of chemicals. Toxicity values for new chemicals may then be calculated by inserting the estimated Kow into the regression equation and correcting the resultant value for the molecular weight of the compound.

Test substance

Identity of test material same as for substance defined in section 1 (if not read-across): yes
SMILES : C(C(C=CC12)C1)(C2C=C3)C3
CHEM : 4,7-Methano-1H-indene, 3a,4,7,7a-tetrahydro-

Materials and methods:

Test organisms (species): fish
Water media type: freshwater
Details on test conditions: Log Kow: 3.165 (EPISuite Kowwin v1.68 Estimate)
Wat Sol: 83.14 (mg/L, EPISuite WSKowwin v1.43 Estimate)

Results:

Effect concentrations
Duration: 30d
Endpoint: ChV
Effect conc.: 1.084 mg/L
Nominal/Measured: no data
Conc. based on: test mat.
Basis for effect: no data
Remarks (e.g. 95% CL): Standard duration assumed

Effect concentrations

Duration: 30d
Endpoint: NOEC
Effect conc.: 0.767 mg/L
Nominal/Measured: no data
Conc. based on: test mat.
Basis for effect: no data
Remarks (e.g. 95% CL): Calculated from ChV

Details on results: When divided by v2 (to adjust for ChV being a geometric mean of NOEC and LOEC), the ChV value corresponds to long-term fish NOEC of 0.767 mg/L.

Conclusions: The estimated ChV value of 1.084 mg/L corresponds to long-term fish NOEC of 0.767 mg/L.

Reliability: 2 (reliable with restrictions)

4.1.15 Chronic toxicity to aquatic invertebrates

Study 1

Data source: OECD SIDS Initial Assessment Report for Dicyclopentadiene (77-73-6) – 4.5.2 Chronic toxicity to aquatic invertebrates
Link: http://www.chem.unep.ch/irptc/sids/OECDSIDS/77736.pdf

and

Data source: ECHA website – Exp Disregarded Long-term toxicity to aquatic invertebrates.003
Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/5

Study reference:

Environment Agency of JAPAN (1997)

Detailed study summary and results:

Chronic toxicity to daphnia magna from Dicyclopentadiene over 21 days showed EC50 4.0 mg/l, NOEC 3.2 mg/l and LOEC 10 mg/l using OECD TG 202 (1984)

Test type:

Test guideline: according to OECD TG 202 (1984)
GLP compliance: no

Test substance

Identity of test material same as for substance defined in section 1 (if not read-across): yes
Details on test material: Organic solid at 20 Degs C impurities unknown 94.9% purity

Materials and methods:

Analytical monitoring: no

Details on sampling: not reporting
Details on test solutions: 5 concentrations 0.1, 0.32, 1.0, 3.2, 10 mg/l in dechlorinated tap water

Test organisms (species): Daphnia magna
Test type: semi-static
Water media type: no data
Total exposure duration: 21d
Post exposure observation period: not reported

Test conditions:
Hardness: 48 to 111 mg/l
Test temperature: not reported
pH: 7.6 to 8.0
Dissolved oxygen: not reported
Salinity: not reported
Nominal and measured concentrations: 0.1, 0.32, 1.0, 3.2, 10 mg/l
Details on test conditions: 4 replicate; 10 daphnids per replicate. DMSO and HCO-4.0 (4:1 mixture 300 mg/l) added as solubilizer

Results:

Effect concentrations
Duration: 21d
Endpoint: EC50
Effect conc.: 4 mg/L
Nominal/Measured: no data
Conc. based on: no data
Basis for effect: reproduction

Duration: 21d
Endpoint: NOEC
Effect conc.: 3.2 mg/L
Nominal/Measured: no data
Conc. based on: no data
Basis for effect: reproduction

Duration: 21d
Endpoint: LOEC
Effect conc.: 10 mg/L
Nominal/Measured: no data
Conc. based on: no data
Basis for effect: reproduction

Conclusions: Chronic toxicity to daphnia magna from Dicyclopentadiene over 21 days showed EC50 4.0 mg/l, NOEC 3.2 mg/l and LOEC 10 mg/l using OECD TG 202 (1984)

Reliability: this information is taken from a reliable peer reviewed source: OECD SIDS.

Study 2

Data source: ECHA website – QSAR WoE Long-term toxicity to aquatic invertebrates.001

Link: http://echa.europa.eu/registration-dossier/-/registered-dossier/15412/6/2/5/?documentUUID=eb502c23-6196-43bb-9a30-34de1d92143b

Study reference:

Computer model. USEPA OPPT Risk Assessment Division
ECOWIN v1 ECOSAR Classes for Microsoft Windows. Nabholz V and Mayo-Bean K. 2009

Detailed study summary and results:

The estimated ChV for Daphnia is 0.812 mg/L, which corresponds to a NOEC of 0.574 mg/L.

Test type:

Principles of method if other than guideline: The ECOSAR class program has been developed primarily for the evaluation of neutral organic compounds and organic classes with excess toxicity. The QSARs in the ECOSAR program are developed for chemical classes based on measured test data that have been submitted by industry or they are developed by other sources for chemicals with similar structures. Using the measured aquatic toxicity values and estimated Kow values, regression equations can be developed for a class of chemicals. Toxicity values for new chemicals may then be calculated by inserting the Kow into the regression equation and correcting the resultant value for the molecular weight of the compound.

Test substance

Identity of test material same as for substance defined in section 1 (if not read-across): yes

Materials and methods:

Test organisms (species): Daphnia sp.
Water media type: freshwater

Results:

Effect concentrations
Duration: 21d
Endpoint: ChV
Effect conc.: 0.812 mg/L
Nominal/Measured: estimated
Conc. based on: test mat.
Basis for effect: no data
Remarks (e.g. 95% CL): Standard duration assumed. Based on a log Kow of 3.165

Effect concentrations
Duration: 21d
Endpoint: NOEC
Effect conc.: 0.574 mg/L
Nominal/Measured: estimated
Conc. based on: test mat.
Basis for effect: no data
Remarks (e.g. 95% CL): Calculated from ChV

Details on results: No further details reported
Conclusions: The estimated ChV for Daphnia is 0.812 mg/L, which corresponds to a NOEC of 0.574 mg/L.

Reliability: 2 (reliable with restrictions)

4.1.16 Chronic toxicity to algae or aquatic plants

[See short-term toxicity]

4.1.17 Acute and/or chronic toxicity to other aquatic organisms

OECD TG 218: Sediment-Water Chironomid Toxicity Using Spiked Sediment and

OECD TG 219: Sediment-Water Chironomid Toxicity Using Spiked Water

No data available.

OECD TG 225: Sediment-Water Lumbriculus Toxicity Test Using Spiked Sediment

No data available.

4.2 Hazardous to the ozone layer

See section 9.2 in the C&L report.