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Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

**Sub-Committee of Experts on the Globally Harmonized
System of Classification and Labelling of Chemicals**

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Implementation of the GHS:

Development of a list of chemicals classified in accordance with the GHS

Report on the proposal for classification and labelling of Dicyclopentadiene: Annex 1

**Transmitted by the secretariat of the Organisation for Economic
Cooperation and Development (OECD)**

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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
No. 248**

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OECD Environment, Health and Safety Publications

Series on Testing & Assessment

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**

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
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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.

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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/OECDSEIDS/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 WHO's 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?db+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 corn oil and contained 20 mg dicyclopentadiene-14C (specific activity 0.20 μ Ci/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 cellulosolve: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, C_{pmax} was 23.28 μ g/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, 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.

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 ($\mu\text{g/ml}$) of ^{14}C radioactivity in rats after a single oral dose of dicyclopentadiene- ^{14}C

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 ^{14}C labelled dicyclopentadiene.

GLP compliance: no data

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

Radiolabelling: yes ^{14}C

Name of test material (as cited in study report): Dicyclopentadiene (DCPD - ^{14}C)

Physical state: uniformly labelled with ^{14}C

Analytical purity of stock: 97%

Lot/batch No.: 895-157

Radiochemical purity (if radiolabelling): 99%

Specific activity (if radiolabelling): 3.02 $\mu\text{Ci/mM}$

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 Laboratories, 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 $\mu\text{Ci}/\text{mg}$) 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, C_{pmax} was 39.9 $\mu\text{g}/\text{ml}$ 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, 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.

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 μ Ci/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 $\mu\text{Ci}/\text{mg}$) 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 cellulose: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, C_{pmax} was 11.36 $\mu\text{g}/\text{ml}$ 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, 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.

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 dairy

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 4×10^8 dpm. The specific activity was 137 dpm/ μ g. 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 dicyclopentadiene 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 glucosylase (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 dicyclopentadiene 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 warming

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:

Dose (mg/kg)	Deaths on day:					Total mortality / total no. rats
	1	2	3	4	5-14	
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:					Total mortality / total no. rats
	1	2	3	4	5-14	
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 warming

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:

Dose (mg/kg)	Deaths on day:					Total mortality / total no. mice
	1	2	3	4	5-14	
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:

Dose (mg/kg)	Deaths on day:					Total mortality / total no. mice
	1	2	3	4	5-14	
167	0	0	0	0	0	0/10
215	3	3	0	0	0	6/10
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/OECD/SIDS/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: dermal: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. Clinical 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 (female). 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

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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: semioclusive

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)		
	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/OECD/SIDS/77736.pdf>

Study reference:

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

Detailed study summary and results:

No details available. Result: Highly irritating.

Test type:

Test method: open irritation 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/OECDSEIDS/77736.pdf>

Study reference:

RTECS Database (Prehled Prumyslove Toxikologie, 50 (1986))

Detailed study summary and results:

No details 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

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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 warming
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
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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/OECD/SIDS/77736.pdf>

Study reference:

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

Detailed study summary and results:

No details available. Result: Irritating.

Test type:

Test method: open irritation 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/OECDSEIDS/77736.pdf>

Study reference:

RTECS Database (Prehled Prumyslove Toxikologie, 50 (1986))

Detailed study summary and results:

No details 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-Dinitro-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-Dinitro-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 Cytogenetics 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±3°C

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 increase 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 homogeneity, concentration, or stability 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/ β -naphthoflavone (80/100 mg/kg bw/day). The S9 was stored 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 μ g/mL (initial toxicity test)

10, 15, 20, 25, 30, 35 μ g/mL (expt 1: 4h -S9)

10, 20, 30, 40, 50, 60 μ g/mL (expt 1: 4h +S9)

5, 10, 20, 30, 40, 50 μ g/mL (expt 2: 24h -S9)

10, 20, 30, 40, 45, 50 μ g/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 solvent 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 cytotoxicity 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 mutagenicity 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 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.

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 *Escherichia 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 by 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 *Escherichia 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/OECD/SIDS/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 (2×10^4 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

Dicyclopentadiene 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/OECDSEIDS/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

ENV/JM/MONO(2016)45/ANN1

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, γ -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 days 0 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

Details 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

Analytical 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 (postnatal 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 mortality 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 fetuses and resorption sites were recorded.

Fetal examinations:

- External examinations: Yes: The fetuses were removed, examined externally for abnormalities and weighed.

- Soft tissue examinations: Yes: One third of the fetuses 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 fetuses 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 fetuses 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 fetuses lower, in the 400 mg/kg group compared to controls. Two litters from this group showed fetuses 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 fetuses: Yes

Fetal examinations:

- Number of live/dead fetuses: 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 Wilcoxon 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 fetuses 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 fetuses 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 Wilcoxon 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

Number of females	Dose Level (mg/kg/day)					
	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 dicyclopentadiene 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 warming

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:

Dose (mg/kg)	Deaths on day:					Total mortality / total no. mice
	1	2	3	4	5-14	
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:

Dose (mg/kg)	Deaths on day:					Total mortality / total no. mice
	1	2	3	4	5-14	
167	0	0	0	0	0	0/10
215	3	3	0	0	0	6/10
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 warming

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:

Dose (mg/kg)	Deaths on day:					Total mortality / total no. rats
	1	2	3	4	5-14	
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:					Total mortality / total no. rats
	1	2	3	4	5-14	
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. Clinical 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, γ -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

Analytical 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, phosphorus, 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 (gastrocnemius), 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 dicyclopentadiene, 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/OECD/SIDS/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 mm²/s at 20°C and 2.811 mm²/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/OECDSEIDS/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 regulatory 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/OECD/SIDS/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 considered 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 ethylcyclopentadiene (22%), balance (16%).

Materials and methods:

Oxygen conditions: other:

Inoculum or test system: other: Activated Sludge 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 biodegradability 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 considered 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 hydrogen 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 BOD₅/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 $119.1993 \times 10^{-12} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$. Half life is calculated based on this rate constant and a hydroxyl radical concentration of $1.5 \times 10^6 \text{ molecule.cm}^{-3}$

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: $0.000000001 \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$

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 = $119.1993 \times 10^{-12} \text{ cm}^3/\text{molecule-sec}$

HALF-LIFE = 0.090 Days (12-hr day; $1.5 \times 10^6 \text{ OH/cm}^3$)

HALF-LIFE = 1.077 Hrs

OVERALL OZONE Rate Constant = $40.000000 \times 10^{-17} \text{ cm}^3/\text{molecule-sec}$

HALF-LIFE = 0.029 Days (at $7 \times 10^{11} \text{ mol/cm}^3$)

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:

Identity 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:

Identity 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 during bioconcentration study appeared normal, fed readily and generally showed no signs of stress due to chemical toxicity. Mean measured concentration of ¹⁴C-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 ¹⁴C-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 portion investigated by radiometric analysis. Each portion of the muscle tissue from each fish sampled was air dried for approximately 24 hrs in a combustion cone at 21 degrees C. Each dried sample was combusted in a Packard Model 306 Tri-Carb Sample Oxidizer. Resulting ¹⁴C² was trapped as a carbonate in a mixture of Carbosorb (1M hyamine hydroxide in methanol) and scintillator cocktail (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 eliminate any residual ¹⁴C-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 diluent water into the test chamber. Three 30 liter experimental units were utilised in the system. 50 bluegill were 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 third 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 concentration of 14 C-DCPD in the water through 14 days of exposure was $.98 \pm 0.25$ 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/OECD/SIDS/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 concentration, 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 Control (acetone), control.

Details on test conditions: Static fish bioassays were conducted in 19.6 liter glass vessels held in contact temperature water baths at 21 +/- 1.0 degrees C for the bluegill, channel catfish, and fathead minnow and at 14 +/- 1.0 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 concentration, 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 Control (acetone), control.

Details on test conditions: Static fish bioassays were conducted in 19.6 liter glass vessels held in contact temperature water baths at 21 ± 1.0 degrees C for the bluegill, channel catfish, and fathead minnow and at 14 ± 1.0 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 concentration, 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 Control (acetone), control.

Details on test conditions: Static fish bioassays were conducted in 19.6 liter glass vessels held in contact temperature water baths at 21 ± 1.0 degrees C for the bluegill, channel catfish, and fathead minnow and at 14 ± 1.0 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 contraction, 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 Control (acetone), control.

Details on test conditions: Static fish bioassays were conducted in 19.6 liter glass vessels held in contact temperature water baths at 21 ± 1.0 degrees C for the bluegill, channel catfish, and fathead minnow and at 14 ± 1.0 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/OECD/SIDS/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/OECD/SIDS/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 al. (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 solution 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 daily, pH and oxygen concentration recorded at 0 and 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: reconstituted 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 Representative 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 progression). 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/?documentUUIID=a8d94d09-ac48-4ab9-94a4-2900a97d6858>

Study reference:

ENV/JM/MONO(2016)45/ANN1

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-47a3-8767-44ce3f62ddb>

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 , Indiciiana 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 , Indiana 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/OECDSEIDS/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/?documentUUIID=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 $\sqrt{2}$ (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 portion investigated.

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 Connecticut and had a mean and standard deviation (N=30) wet weight of 1.75 ± 0.65 g 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 diluent water into the test chamber. Three 30 liter experimental units were utilised in the system. 50 bluegill were 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 third 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 $\sqrt{2}$ (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/OECD/SIDS/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.