

5. Toxicity

date: 18-FEB-2000
Substance ID: 106-97-8

Species: rat **Sex:** male/female
Strain: Fischer 344
Route of admin.: inhalation
Exposure period: 90 days
Frequency of treatment: 6 hours per day, 5 days per week
Post. obs. period:
Doses: 2 Test groups: 1017 ppm and 4489 ppm (20 male/10 female per group). Negative control group: no treatment (40 male/20 female animals).
Control Group: yes, concurrent no treatment
NOAEL: 4489 ppm
Method: other: procedure as detailed in paper by Aranyi (see Reference).
Year: 1986 **GLP:** no data
Test substance: other TS
Remark: Atmospheric concentrations were monitored during the study. The main objective of the study was to establish the renal effects of gaseous hydrocarbons.
Result: There were NO DEATHS, and NO OTHER SIGNIFICANT TOXICOLOGICALEFFECTS were found.

Serial sacrifices of 10 male and 5 female animals were made after 28 days. The male animals in these groups showed mildbut significant effects characteristic of light hydrocarbon nephropathy. However, at 90 days the animals showed no evidence of kidney effects.

Clinical signs included HUNCHED POSTURE, LETHARGY and INTERMITTENT TREMOR. No effects were evident from bodyweights, haematological and biochemical parameters, or from histopathology.
Source: Compañia Española de Petroleos CEPSA Madrid
Test substance: Tests were carried out on two gas mixtures comprising:
50% n-butane and 50% n-pentane, and
50% iso-butane and 50% iso-pentane.

(113)

Species: rat **Sex:** male/female
Strain: Sprague-Dawley
Route of admin.: inhalation
Exposure period: 21 days
Frequency of treatment: 6 hours per day, 5 days per week
Post. obs. period:
Doses: 3 Test groups: 0.12 mg/l, 1.15 mg/l and 11.80 mg/l (10 male/10 female per group). Negative control group: no treatment (10 male/10 female animals).
Control Group: yes, concurrent no treatment
NOAEL: 11.8 mg/l
Method: other: procedure as detailed in paper by Halder et al. (see Reference).
Year: 1986 **GLP:** no data
Test substance: other TS
Remark: Atmospheric concentrations were monitored during the study. The main objective of the study was to establish if typical C4 and C5 hydrocarbons could cause kidney damage in male rats.
Result: NO SIGNIFICANT TOXICOLOGICAL EFFECTS were found.

Animals showed no clinical signs of distress.

Haematological and biochemical parameters were not significantly different from the negative control group. Bodyweight gains were not abnormal. In particular, there was no evidence of treatment-related pathological lesions, especially the kidney lesions found in male rats exposed to unleaded gasoline vapour.

Source: Compañía Española de Petroleos CEPSA Madrid
Test substance: Tests were carried out on a gas mixture containing 25% by weight of each of the hydrocarbon constituents n-butane, isobutane, n-pentane and isopentane.

(114)

Species: rat **Sex:** male/female
Strain: Fischer 344
Route of admin.: inhalation
Exposure period: 90 days
Frequency of treatment: 6 hours per day, 5 days per week
Post. obs. period:
Doses: 2 Test groups: 1017 ppm and 4489 ppm (20 male/10 female per group). Negative control group: no treatment (40 male/20 female animals).
Control Group: yes, concurrent no treatment
NOAEL: 4489 ppm
Method: other: procedure as detailed in paper by Aranyi (see Reference).
Year: 1986 **GLP:** no data
Test substance: other TS
Remark: Atmospheric concentrations were monitored during the study. The main objective of the study was to establish the renal effects of gaseous hydrocarbons.

Result: There were NO DEATHS, and NO OTHER SIGNIFICANT TOXICOLOGICAL EFFECTS were found.

Serial sacrifices of 10 male and 5 female animals were made after 28 days. The male animals in these groups showed mild but significant effects characteristic of light hydrocarbon nephropathy. However, at 90 days the animals showed no evidence of kidney effects.

Clinical signs included HUNCHED POSTURE, LETHARGY and INTERMITTENT TREMOR. No effects were evident from bodyweights, haematological and biochemical parameters, or from histopathology.

Source: Phillips Petroleum Company Norway Tananger
Test substance: Tests were carried out on two gas mixtures comprising:
50% n-butane and 50% n-pentane, and
50% iso-butane and 50% iso-pentane.

(115)

Species: rat **Sex:** male/female
Strain: Sprague-Dawley
Route of admin.: inhalation
Exposure period: 21 days
Frequency of treatment: 6 hours per day, 5 days per week
Post. obs. period:
Doses: 3 Test groups: 0.12 mg/l, 1.15 mg/l and 11.80 mg/l (10 male/10 female per group). Negative control group: no treatment (10 male/10 female animals).
Control Group: yes, concurrent no treatment
NOAEL: 11.8 mg/l
Method: other: procedure as detailed in paper by Halder et al. (see Reference).
Year: 1986 **GLP:** no data
Test substance: other TS
Remark: Atmospheric concentrations were monitored during the study. The main objective of the study was to establish if typical C4 and C5 hydrocarbons could cause kidney damage in male rats.
Result: NO SIGNIFICANT TOXICOLOGICAL EFFECTS were found.

Animals showed no clinical signs of distress.

Haematological and biochemical parameters were not significantly different from the negative control group. Bodyweight gains were not abnormal. In particular, there was no evidence of treatment-related pathological lesions, especially the kidney lesions found in male rats exposed to unleaded gasoline vapour.

Source: Phillips Petroleum Company Norway Tananger
Test substance: Tests were carried out on a gas mixture containing 25% by weight of each of the hydrocarbon constituents n-butane, isobutane, n-pentane and isopentane.

(116)

5. Toxicity

date: 18-FEB-2000
Substance ID: 106-97-8

Species: rat **Sex:** male/female
Strain: Fischer 344
Route of admin.: inhalation
Exposure period: 90 days
Frequency of treatment: 6 hours per day, 5 days per week
Post. obs. period:
Doses: 2 Test groups: 1017 ppm and 4489 ppm (20 male/10 female per group). Negative control group: no treatment (40 male/20 female animals).
Control Group: yes
NOAEL: 4489 ppm
Method: other: procedure as detailed in paper by Aranyi (see Reference).
Year: 1986 **GLP:** no data
Test substance: other TS
Remark: Atmospheric concentrations were monitored during the study. The main objective of the study was to establish the renal effects of gaseous hydrocarbons.
Result: There were NO DEATHS, and NO OTHER SIGNIFICANT TOXICOLOGICAL EFFECTS were found. Serial sacrifices of 10 male and 5 female animals were made after 28 days. The male animals in these groups showed mild but significant effects characteristic of light hydrocarbon nephropathy. However, at 90 days the animals showed no evidence of kidney effects. Clinical signs included HUNCHED POSTURE, LETHARGY and INTERMITTENT TREMOR. No effects were evident from bodyweights, haematological and biochemical parameters, or from histopathology.
Source: CONCAWE Brussel
Huels AG Marl
Test substance: Tests were carried out on two gas mixtures comprising:
50% n-butane and 50% n-pentane, and
50% iso-butane and 50% iso-pentane.

(117) (118)

5. Toxicity

Species: rat **Sex:** male/female
Strain: Sprague-Dawley
Route of admin.: inhalation
Exposure period: 21 days
Frequency of treatment: 6 hours per day, 5 days per week
Post. obs. period:
Doses: 3 Test groups: 0.12 mg/l, 1.15 mg/l, and 11.80 mg/l (10 male/10 females per group). Negative control group: no treatment (10 male/10 female animals).
Control Group: yes
NOAEL: 11.8 mg/l
Method: other: procedure as detailed in paper by Halder et al. (see Reference).
Year: 1986 **GLP:** no data
Test substance: other TS
Remark: Atmospheric concentrations were monitored during the study. The main objective of the study was to establish if typical C4 and C5 hydrocarbons could cause kidney damage in male rats.
Result: NO SIGNIFICANT TOXICOLOGICAL EFFECTS were found. Animals showed no clinical signs of distress. Haematological and biochemical parameters were not significantly different from the negative control group. Bodyweight gains were not abnormal. In particular, there was no evidence of treatment-related pathological lesions, especially the kidney lesions found in male rats exposed to unleaded gasoline vapour.
Source: CONCAWE Brussel
Huels AG Marl
Test substance: Tests were carried out on a gas mixture containing 25% by weight of each of the hydrocarbon constituents n-butane, isobutane, n-pentane and isopentane.

(119)

5.5 Genetic Toxicity 'in Vitro'

Type: Ames test
System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.
Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air
Metabolic activation: with and without
Result: negative
Method: other: OECD guideline 479 method adapted to test gaseous substances
Year: **GLP:** no data
Test substance: other TS
Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of propane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

5. Toxicity

date: 18-FEB-2000
Substance ID: 106-97-8

Source: Elf Aquitaine Lacq
OK Raffinaderi AB Göteborg
Skandinaviska Raffinaderi AB Lysekil

Test substance: Propane, CAS No. 74-98-6 (120)

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of butane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: Elf Aquitaine Lacq

Test substance: n-Butane, CAS No. 106-97-8 (120)

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of isobutane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: Elf Aquitaine Lacq

Test substance: Isobutane, CAS No. 75-28-5 (120)

Type: Ames test
System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535; TA1537 and TA1538.
Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air
Metabolic activation: with and without
Result: negative
Method: other: OECD guideline 479 method adapted to test gaseous substances
Year: GLP: no data
Test substance: other TS
Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of propane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.
Source: Compañía Española de Petroleos CEPSA Madrid
Test substance: Propane, CAS No. 74-98-6 (121)

Type: Ames test
System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.
Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air
Metabolic activation: with and without
Result: negative
Method: other: OECD guideline 479 method adapted to test gaseous substances
Year: GLP: no data
Test substance: other TS
Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of butane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.
Source: Compañía Española de Petroleos CEPSA Madrid
Test substance: n-Butane, CAS No. 106-97-8 (121)

Type: Ames test
System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.
Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air
Metabolic activation: with and without
Result: negative
Method: other: OECD guideline 479 method adapted to test gaseous substances
Year: GLP: no data
Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of isobutane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: Compañía Española de Petroleos CEPSA Madrid

Test substance: Isobutane, CAS No. 75-28-5 (121)

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of butane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: OK Raffinaderi AB Göteborg

Test substance: n-Butane, CAS No. 106-97-8 (120)

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of isobutane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: OK Raffinaderi AB Göteborg

Test substance: Isobutane, CAS No. 75-28-5 (120)

5. Toxicity

date: 18-FEB-2000
Substance ID: 106-97-8

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535; TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of butane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: Skandinaviska Raffinaderi AB Lysekil

Test substance: n-Butane, CAS No. 106-97-8 (120)

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of isobutane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: Skandinaviska Raffinaderi AB Lysekil

Test substance: Isobutane, CAS No. 75-28-5 (120)

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

5. Toxicity

date: 18-FEB-2000
Substance ID: 106-97-8

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of propane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: Phillips Petroleum Company Norway Tananger

Test substance: Propane, CAS No. 74-98-6 (122)

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of butane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: Phillips Petroleum Company Norway Tananger

Test substance: n-Butane, CAS No. 106-97-8 (122)

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of isobutane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: Phillips Petroleum Company Norway Tananger

Test substance: Isobutane, CAS No. 75-28-5 (122)

Type: Ames test

System of testing: Salmonella typhimurium, reverse mutation assay using strains TA98, TA100, TA1535, TA1537 and TA1538.

Concentration: atmospheric concentrations of 5, 10, 20, 30, 40, and 50% (vol/vol) in air

Metabolic activation: with and without

Result: negative

Method: other: OECD guideline 479 method adapted to test gaseous substances

Year: GLP: no data

Test substance: other TS

Remark: Five strains of Salmonella typhimurium were exposed for six hours to concentrations of up to 50% (vol/vol) of butane in air. 50% was the highest non-toxic dose. There was no evidence of a significant increase in mutation frequency either in the presence or absence of metabolic activation.

Source: CONCAWE Brussel
Huels AG Marl

Test substance: n-Butane, CAS No. 106-97-8 (123)

Type: Ames test

System of testing: S. typhimurium TA98, TA100, TA1535, TA1537, TA1538, E. coli WP2uvrA

Concentration: 250, 625, 1250, 2500, 5000, 10000 ppm

Metabolic activation: with and without

Result: negative

Method: other: as discribed in the paper by Matsushita et al. see reference

Year: 1981 GLP: no data

Test substance: other TS

Source: Huels AG Marl

Test substance: purity 99% (124)

5.6 Genetic Toxicity 'in Vivo'

5.7 Carcinogenicity

Species: Sex:
 Strain:
 Route of admin.:
 Exposure period:
 Frequency of treatment:
 Post. obs. period:
 Doses:
 Result:
 Control Group:
 Method:
 Year: GLP:
 Test substance: other TS
 Remark: 1,3-butadiene, a possible constituent of petroleum gases, has been shown to be carcinogenic in rodents in inhalation studies, but there is no direct evidence for its carcinogenicity in man.
 Source: Elf Aquitaine Lacq
 OK Raffinaderi AB Göteborg
 Skandinaviska Raffinaderi AB Lysekil
 Test substance: 1,3-butadiene (125)

Species: Sex:
 Strain:
 Route of admin.:
 Exposure period:
 Frequency of treatment:
 Post. obs. period:
 Doses:
 Result:
 Control Group:
 Method:
 Year: GLP:
 Test substance: other TS
 Remark: 1,3-butadiene, a possible constituent of petroleum gases, has been shown to be carcinogenic in rodents in inhalation studies, but there is no direct evidence for its carcinogenicity in man.
 Source: Compañia Española de Petroleos CEPSA Madrid
 Test substance: 1,3-butadiene (126)

Species: Sex:
 Strain:
 Route of admin.:
 Exposure period:
 Frequency of treatment:
 Post. obs. period:
 Doses:
 Result:
 Control Group:
 Method:
 Year: GLP:
 Test substance: other TS
 Remark: 1,3-butadiene, a possible constituent of petroleum gases, has been shown to be carcinogenic in rodents in inhalation studies, but there is no direct evidence for its carcinogenicity in man.
 Source: Phillips Petroleum Company Norway Tananger
 Test substance: 1,3-butadiene

(127)

5.8 Toxicity to Reproduction

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5.9 Developmental Toxicity/Teratogenicity

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5.10 Other Relevant Information

Type: Biochemical or cellular interactions
 Remark: Inhalation of butane sensitises the myocardium of the dog to adrenaline.
 Source: Huels AG Marl

(128)

Type: Metabolism
 Remark: 10-week-old male ICR mice inhaled n-butane (purity 99.8%) for 1 hour (concentration of n-butane in air not reported). After exposure, unchanged n-butane, sec-butanol and methyl ethyl ketone were detected in the blood and various organs of the animals.
 In vitro reactions of n-butane with liver microsomes produced sec-butanol. It is assumed that n-butane is first converted to sec-butanol by microsomal enzyme systems and then to methyl ethyl ketone by alcohol dehydrogenase.
 Source: Huels AG Marl

(129)

Type: Metabolism
Remark: Peptide-bound leucine, when incubated in an iron/ascorbate/GSH system, released small amounts of propane, ethane and butane, as did bovine serum albumin or casein. Butane generation was inhibited by hydroxyl radical scavengers, but catalase and superoxide dismutase were more efficient.
Source: Huels AG Marl (130)

5.11 Experience with Human Exposure

Remark: Ikoma records 20 cases of sudden death in which propane and propylene were found in the blood, urine and cerebrospinal fluids of the victims.
Source: Elf Aquitaine Lacq
OK Raffinaderi AB Göteborg
Skandinaviska Raffinaderi AB Lysekil (131)

Remark: Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.
Source: Elf Aquitaine Lacq (132)

Remark: During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.
Source: Elf Aquitaine Lacq (133)

Remark: Lactic acid production in workers experiencing propane "poisoning" was reported as slight.
Source: Elf Aquitaine Lacq (133)

Remark: Ikoma records 20 cases of sudden death in which propane and propylene were found in the blood, urine and cerebrospinal fluids of the victims.
Source: Compañia Española de Petroleos CEPSA Madrid (134)

Remark: Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.
Source: Compañia Española de Petroleos CEPSA Madrid (135)

- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.
- Source:** Compañia Española de Petroleos CEPSA Madrid (136)
- Remark:** Lactic acid production in workers experiencing propane "poisoning" was reported as slight.
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- Remark:** Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.
- Source:** OK Raffinaderi AB Göteborg (132)
- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.
- Source:** OK Raffinaderi AB Göteborg (133)
- Remark:** Lactic acid production in workers experiencing propane "poisoning" was reported as slight.
- Source:** OK Raffinaderi AB Göteborg (133)
- Remark:** Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.
- Source:** Skandinaviska Raffinaderi AB Lysekil (132)
- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.
- Source:** Skandinaviska Raffinaderi AB Lysekil (133)

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Substance ID: 106-97-8

- Remark:** Lactic acid production in workers experiencing propane "poisoning" was reported as slight.
Source: Skandinaviska Raffinaderi AB Lysekil (133)
- Remark:** Ikoma records 20 cases of sudden death in which propane and propylene were found in the blood, urine and cerebrospinal fluids of the victims.
Source: Phillips Petroleum Company Norway Tananger (137)
- Remark:** Human volunteers exposed to isobutane concentrations ranging from 250 to 10000 ppm for up to eight hours, and to 500 ppm for one to eight hours per day for ten days, showed no deleterious effects.
Source: Phillips Petroleum Company Norway Tananger (138)
- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.
Source: Phillips Petroleum Company Norway Tananger (139)
- Remark:** Lactic acid production in workers experiencing propane "poisoning" was reported as slight.
Source: Phillips Petroleum Company Norway Tananger (139)
- Remark:** During laboratory investigations of workers bottling liquefied gases (propane and butane), most of the workers complained of respiratory symptoms, e.g. dry cough and dry throat together with gastrointestinal effects. The electrocardiographic findings in some workers indicated sinus tachycardia, extrasystole and incomplete right bundle branch block.
Source: CONCAWE Brussel
Huels AG Marl (140)
- Remark:** A rare case of death associated with inhalation of lighter refill gas (containing propane, propylene, ethane, iso-butane and n-butane) is reported. A 13-year-old boy died suddenly after several inhalations of lighter refill gas which had been sprayed into a vinyl bag. The exact duration of sniffing is not known, but may have been a few hours. N-butane, iso-butane and propane were detected in the blood, brain, heart, lung, liver, kidney and fatty tissue of the decedent. The highest gas levels were detected in the fatty tissue and the lowest in the lung. Based upon the autopsy findings and the result of the gas analysis, the cause of death was concluded to be cardiac arrhythmia and lung edema due to butane inhalation.

- Source:** Huels AG Marl (141)
- Remark:** A newborn with hydranencephaly is reported whose mother suffered severe intoxication from "butane gas" (details not reported) during the 27th week of pregnancy. The anoxic nature of the insult to the fetus was obvious. The authors believe it was highly probable that the fetus was hypoxic during a period of maternal hypoxaemia and that this resulted in massive brain-tissue necrosis with subsequent cavitation and resorption of necrotized tissue.
- Source:** Huels AG Marl (142)
- Remark:** A 2-year-old child presented with seizures and ventricular tachycardia shortly after playing with cosmetics, shampoo, and an aerosol can of a proprietary deodorant. She required intensive care and survived without sequelae. The propellants used in the aerosol can were iso-butane, n-butane and propane. Exposure was confirmed by detection of n-butane and iso-butane in the patient's serum.
- Source:** Huels AG Marl (143)
- Remark:** An unusual case of transient hemiparesis in a 15-year-old boy, resulting from acute intoxication following inhalation of butane gas (amount unknown) from a cigarette lighter fuel canister is reported. On examination the boy was found to have a right sided hemiparesis characterised by markedly reduced power - grade 1/5 in both the right arm and leg, flaccid tone and absent reflexes with an extensor planter reflex on this side. The remainder of the physical examination was normal. Within 24 h of admission, power in his right hand and forearm had improved to grade 3/5. When he was discharged 5 days later, he still had a pronounced upper limb proximal muscle weakness and a hemiplegic gait.
- Source:** Huels AG Marl (144)
- Remark:** The case of a 17 year old abuser of butane aerosols who developed fulminant hepatic failure after taking a proprietary engine or carburetor cleaner is described.
- Source:** Huels AG Marl (145)
- Remark:** The phenomenology of solvent inhalation was investigated comparing a group of young people who misused toluene (n=31) with a group misusing butane (n=12). Marked changes of mental state were invariable. Most users reported elevation of mood and hallucinations but a rich variety of phenomena was elicited. Nearly one-quarter of subjects had the delusion of believing they were able to fly or swim.
- Source:** Huels AG Marl (146)

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