

Piperonyl Butoxide

sc-208174



The Power is Question

Material Safety Data Sheet

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Piperonyl Butoxide

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Santa Cruz Biotechnology, Inc.
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EMERGENCY:

ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS

C19-H30-O5, "methylenedioxybenzene synergist", "5-((2-(2-butoxyethoxy)ethoxy)methyl)-6-propyl-1, 3-benzodioxole", "1, 3-benzodioxole, 5-((2-(2-butoxyethoxy)ethoxy)methyl)-6-propyl-", butacide, "butyl carbitol 6-propylpiperonyl ether", butocide, "butyl-carbityl (6-propylpiperonyl) ether", butoxide, "(3, 4-methylenedioxy-6-propylbenzyl) (butyl) diethylene glycol ether", "alpha-(2-(2-butoxyethoxy)ethoxy)-4, 5-methylenedioxy-2-propyltoluene", "(3, 4-methylenedioxy-6-propyl) piperonyl ether", "(3, 4-methylenedioxy-6-propylbenzyl)(butyl)diethylene glycol ether", Nusyn-noxfish, "6-(propylpiperonyl)-butyl carbityl ether", PB, "6-propylpiperonyl butyl diethylene glycol ether", Prentox, "3, 4-methylenedioxy-6-propylbenzyl n-butyl diethyleneglycol ether", Pybuthrin, "Pyrenone 606", Synpren-fish, "alpha-(2-(2-n-butoxyethoxy)-ethoxy)-4, 5-methylenedioxy-2-propyltoluene"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability:	1	
Toxicity:	2	
Body Contact:	0	
Reactivity:	1	
Chronic:	3	

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Vapours may cause drowsiness and dizziness.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Accidental ingestion of the material may be damaging to the health of the individual.

■ Studies suggest that by interfering with the metabolism of hormones, methylenedioxyphenol synergists such as the piperonyls (as piperonyl butoxide - PBO) may damage humeral organs such as the thyroid, adrenal, and pituitary glands. PBO has a low to moderate toxicity based on short-term laboratory animal studies. The acute oral LD50, or dose that kills half the test population, was determined to be 6.15 g/kg for rats. It is predicted that the oral lethal dose for a human is 5.15 g/kg, or between 1 pint and 1 quart for a 150 lb person. Symptoms caused by ingestion of PBO in large doses include nausea, cramps, vomiting, and diarrhea. Overdoses of PBO have been shown to cause hyperexcitability, unsteadiness, coma, seizures, and brain damage in animals. Laboratory animals exposed to single, large oral doses exhibit anorexia, vomiting, diarrhoea, unsteadiness, rough coat, watery eyes, irritability, prostration, haemorrhagic enteritis, inanition, pulmonary haemorrhage, mild central system depression, bloody discharge from eyes and nose, liver damage, coma and death. Onset may be as early as 20 minutes after dosing and death may be delayed for a week. Most rat deaths in studies are attributed to hemorrhages in the digestive tract, particularly the large intestine. Acute exposure in animals has also triggered hepatic (liver) changes and injury, anemia and loss of appetite, as well as changes in the kidneys, nasal bleeding, loss of muscle coordination, and abdominal swelling.

Chemical Watch Fact Sheet.

■ Methylenedioxybenzene synergists cause loss of appetite, vomiting, diarrhea, inflamed bowel with bleeding, bleeding from the lung, wasting and possible central depression.

■ Central nervous system (CNS) depression may include general discomfort, symptoms of giddiness, headache, dizziness, nausea, anaesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal.

EYE

■ Although the liquid is not thought to be an irritant, direct contact with the eye may produce transient discomfort characterized by tearing or conjunctival redness (as with windburn).

■ Acute and repeated eye contact with piperonyls (as piperonyl butoxide - PBO) has been shown to be slightly irritating, but is not linked to long-term damage.

SKIN

■ The liquid may be miscible with fats or oils and may degrease the skin, producing a skin reaction described as non-allergic contact dermatitis. The material is unlikely to produce an irritant dermatitis as described in EC Directives.

■ Acute and repeated dermal (skin) contact with piperonyls (as piperonyl butoxide - PBO) has been shown to be slightly irritating, but is not linked to long-term damage.

In one study a lethal dose in rabbits by dermal absorption was 200 mg/kg but this result is thought to be anachronistic. A dermal application of PBO, at the rate of 1880 mg/kg as a 20% solution in dimethyl phthalate, produced hyperexcitability and convulsions in rabbits.

■ Open cuts, abraded or irritated skin should not be exposed to this material.

■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ The material is not thought to produce respiratory irritation (as classified using animal models). Nevertheless inhalation of vapors, fumes or aerosols, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.

■ Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo.

■ Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.

■ The LD50 for inhalation of the methylenedioxyphenol synergist, piperonyl butoxide (PBO), by rats is greater than 5.9 g/kg. Inhalation of large amounts of PBO may cause tearing, salivation, labored breathing, accumulation of fluids in the lungs, and may be linked to respiratory problems, including asthma.

Exposure to high concentrations of PBO vapour may cause asthma, inflammation of the nose and mucous membrane irritation.

■ Methylenedioxybenzene synergists cause loss of appetite, vomiting, diarrhea, inflamed bowel with bleeding, bleeding from the lung, wasting and possible central depression.

CHRONIC HEALTH EFFECTS

■ There has been some concern that this material can cause cancer or mutations but there is not enough data to make an assessment.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

There is some evidence to provide a presumption that human exposure to the material may result in impaired fertility on the basis of: some evidence in animal studies of impaired fertility in the absence of toxic effects, or evidence of impaired fertility occurring at around the same dose levels as other toxic effects but which is not a secondary non-specific consequence of other toxic effects.

Exposure to the material may cause concerns for humans owing to possible developmental toxic effects, on the basis that similar materials tested in appropriate animal studies provide some suspicion of developmental toxicity in the absence of signs of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not a secondary non-specific consequence of other toxic effects.

The primary effect of long-term exposure to methylenedioxyphenol insect synergists such as the piperonyls (such as piperonyl butoxide - PBO) in animals is an increase in liver and thyroid weight, liver and kidney damage, and a decrease in body weight. These symptoms were observed in a diet of 52.8 mg/kg or more a day in a chronic study with dogs.

PBO is a possible human carcinogen. Currently there is no data from accidental exposure available regarding its carcinogenicity in humans; the only information is from animal studies. Several studies have shown that PBO treatment in rats causes an increase in liver cancer at high doses. The incidence of hepatocellular carcinoma, in male and female rats given 2.4% piperonyl butoxide was 80.0% and 57.7% respectively. Preneoplastic hepatic lesions such as nodular hyperplasia, cholangiofibrosis, and modular hyperplasia were also seen.

Some studies have shown that PBO treatment in rats corresponds with a very slight increase in thyroid cancer.

Rats fed diets containing from 0.6 to 2.4% piperonyl butoxide for approximately two years showed dose-related decreases in body weight. Roughened hair, lethargy, epistaxis, abdominal swelling, and decreased food consumption were observed at 2.4%. All dose rates induced skin tumours after about 1 year. Cumulative mortality varied from around 15 to 50%. Caecal haemorrhage was the cause of death. Dead rats with hepatic tumours were seen from week 74, but caecal haemorrhage or possible leukaemia was the cause of death. At necropsy in rats surviving to the end of the study, hepatocellular adenomas and carcinomas occurred in both sexes in a dose-related manner. A dose-related increase in thrombocytopenia was seen in male rats. The authors * of this study concluded that the primary feature of chronic piperonyl-butoxide toxicity is hepatocarcinogenicity.

It is generally accepted that PBO does not demonstrate any significant potential for mutagenicity (genetic damage) but debate still exists. PBO weakens the immune system by inhibiting lymphocyte response. Lymphocytes are a class of white blood cells that consume potentially dangerous pathogens and release antibodies. Inhibiting lymphocyte response weakens the body's ability to defend against foreign invaders. Preventing the breakdown of toxic chemicals, may exacerbate potentially toxic effects.

PBO has been shown to adversely affect a variety of reproductive functions. Two-generational laboratory studies on rats show that litter weight and size are less for mothers exposed to high concentrations of PBO, and there is an increase in birth defects and fetal death. In one study the difference in the average weight of PBO-exposed offspring immediately after birth is negligible, but 7-14 days post-natal is significantly greater for those mothers that are exposed to PBO than for those that are not. The U.S. EPA maintains that results for teratogenicity (the ability to produce birth defects) in animals have been mixed, and while some studies suggest some teratogenicity, most do not. PBO may also interfere with sexual development because the enzymes it inhibits are responsible not only for the breakdown of toxic chemicals but also for the metabolism of other compounds such as steroids, which include the sex hormones. Rats exposed to PBO over the course of two years experience an atrophy of the testes (a decrease in weight of the seminal vesicles (sperm producing structures), and an increase in ovarian weights. There is no evidence that PBO affects fertility.

Data has shown that PBO alone interferes with enzymes that maintain homeostasis of sodium and calcium in the brain and nervous system, possibly affecting neural response. Additionally, it increases the neurotoxicity of other compounds. Despite this data, EPA believes that these neurotoxic effects are slight and maintains that PBO poses no neurological risk.

Behavioral changes have been noted with PBO as well. In a laboratory experiment, exposed rats experience more trouble navigating a maze than unexposed rats. The exposed rats travel longer distances and turned more frequently in the maze. PBO also induces changes in olfactory behavior of the offspring of exposed mothers. Offspring of exposed mothers are less likely to enter a compartment that smells like home than unexposed mothers. Exploratory behavior in mice increases as the dose of PBO they were treated with increased. This data shows that PBO has the ability to affect behaviors in mammals.

Research on rats has found that PBO can cause intestinal ulcers and bleeding. Liver damage is common in studies, and kidney damage has been found as well. Long-term ingestion of PBO causes anemia, a decrease in the amount of hemoglobin (oxygen-transporting molecules) in blood, and increases the blood cholesterol level in rats. PBO can also damage the larynx, and there have been reports that it can cause labored breathing, an accumulation of fluid in the lungs, nasal bleeding, abdominal swelling, and loss of the ability to coordinate muscle movement. There has been a fair amount of investigation into the effects of dermal contact with PBO since it is used as a topical agent for lice, but there has been no evidence of it causing any local or systemic toxicity, and the amount of PBO absorbed from skin contact is characterized by some researchers as low.

ChemicalWatch Fact Sheet

Takahashi, O., S. et al: Fundamental and Applied Toxicology: Vol 22., pp 293-303, Feb 1994.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
piperonyl butoxide	51-03-6	>98

Section 4 - FIRST AID MEASURES

SWALLOWED

· If swallowed do NOT induce vomiting. · If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

EYE

■ If this product comes in contact with the eyes: · Wash out immediately with fresh running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN

■ If skin or hair contact occurs: · Flush skin and hair with running water (and soap if available). · Seek medical attention in event of irritation.

INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested.

NOTES TO PHYSICIAN

■ Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Not available.
Upper Explosive Limit (%):	Not available.
Specific Gravity (water=1):	1.04-1.07
Lower Explosive Limit (%):	Not available.

EXTINGUISHING MEDIA

- Foam.
- Dry chemical powder.

FIRE FIGHTING

- Alert Emergency Responders and tell them location and nature of hazard.
 - Wear full body protective clothing with breathing apparatus.
- When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 100 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- Combustible.
 - Slight fire hazard when exposed to heat or flame.
- Combustion products include: carbon dioxide (CO₂), other pyrolysis products typical of burning organic material.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

- Glasses:
Chemical goggles.
- Gloves:
- Respirator:
Type A-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Environmental hazard - contain spillage.
- Clean up all spills immediately.
- Avoid breathing vapors and contact with skin and eyes.

MAJOR SPILLS

- Environmental hazard - contain spillage.
- Moderate hazard.
- Clear area of personnel and move upwind.
 - Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS

- Metal can or drum
- Packing as recommended by manufacturer.

STORAGE REQUIREMENTS

- Store in original containers.

- Keep containers securely sealed.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

- piperonyl butoxide: CAS:51-03-6

PERSONAL PROTECTION



RESPIRATOR

Type A-P Filter of sufficient capacity

Consult your EHS staff for recommendations

EYE

- Safety glasses with side shields
- Chemical goggles.

HANDS/FEET

■ Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

Wear chemical protective gloves, eg. PVC.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

ENGINEERING CONTROLS

■ Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

Does not mix with water.

Sinks in water.

State	Liquid	Molecular Weight	338.49
Melting Range (°F)	Not available.	Viscosity	Not Available
Boiling Range (°F)	356F @ 0.13 kPa	Solubility in water (g/L)	Immiscible
Flash Point (°F)	339.8	pH (1% solution)	Not applicable.
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available.	Vapour Pressure (mmHG)	Not available.
Upper Explosive Limit (%)	Not available.	Specific Gravity (water=1)	1.04-1.07

Lower Explosive Limit (%)	Not available.	Relative Vapor Density (air=1)	Not available.
Volatile Component (%vol)	Not available.	Evaporation Rate	Not available

APPEARANCE

Pale yellow to light brown liquid with a mild odour. Insoluble in water but miscible with methanol, ethanol, benzene, freons, petroleum hydrocarbons, oils and other organic solvents.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.

STORAGE INCOMPATIBILITY

- Avoid reaction with oxidizing agents.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

PIPERONYL BUTOXIDE

TOXICITY AND IRRITATION

PIPERONYL BUTOXIDE:

- unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
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Oral (rat) LD50: 6150 mg/kg	Nil Reported
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Dermal (rat) LD50: >7950 mg/kg	
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Dermal (Rat) LD50: *200 mg/kg	
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Oral (Rabbit) LD50: 2650 mg/kg	
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Oral (Mouse) LD50: 2600 mg/kg	
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- **The substance is classified by IARC as Group 3:**

NOT classifiable as to its carcinogenicity to humans.

Evidence of carcinogenicity may be inadequate or limited in animal testing.

Dermal (rabbit) LD50: >1880 mg/kg [Handbook of Toxicology]

*Published value - probably not peer-reviewed

ADI: 0.03 mg/kg

CARCINOGEN

PIPERONYL BUTOXIDE	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	OPP-CAN
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Section 12 - ECOLOGICAL INFORMATION

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

This material and its container must be disposed of as hazardous waste.

Avoid release to the environment.

Refer to special instructions/ safety data sheets.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
piperonyl butoxide	HIGH		LOW	HIGH

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

‡ Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult Waste Management Authority for disposal.

Section 14 - TRANSPORTATION INFORMATION



DOT:

Symbols: G Hazard class or Division: 9

Identification Numbers: UN3082 PG: III

Label Codes: 9 Special provisions: 8, 146,
335, IB3,

T4, TP1,

TP29

Packaging: Exceptions: 155 Packaging: Non- bulk: 203

Packaging: Exceptions: 155 Quantity limitations: No limit

Passenger aircraft/rail:

Quantity Limitations: Cargo No limit Vessel stowage: Location: A
aircraft only:

Vessel stowage: Other: None

Hazardous materials descriptions and proper shipping names:

Environmentally hazardous substance, liquid, n.o.s

Air Transport IATA:

ICAO/IATA Class: 9 ICAO/IATA Subrisk: None

UN/ID Number: 3082 Packing Group: III

Special provisions: A97

Cargo Only

Packing Instructions: 914 Maximum Qty/Pack: 450 L

Passenger and Cargo Passenger and Cargo

Packing Instructions: 914 Maximum Qty/Pack: 450 L

Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity

Packing Instructions: Y914 Maximum Qty/Pack: 30 kg G

Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID,
N.O.S. *(CONTAINS PIPERONYL BUTOXIDE)

Maritime Transport IMDG:

IMDG Class: 9 IMDG Subrisk: None

UN Number: 3082 Packing Group: III

EMS Number: F-A , S-F Special provisions: 179 274 335 909

Limited Quantities: 5 L Marine Pollutant: Yes

Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

Section 15 - REGULATORY INFORMATION

pipernyl butoxide (CAS: 51-03-6) is found on the following regulatory lists;

"International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","US EPCRA Section 313 Chemical List","US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act","US NFPA 30B Manufacture and Storage of Aerosol Products - Chemical Heat of Combustion","US Toxic Substances Control Act (TSCA) - Inventory"

Section 16 - OTHER INFORMATION

ND

Substance CAS Suggested codes piperonyl butoxide 51- 03- 6

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■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:

www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Issue Date: Oct-25-2009

Print Date:Dec-22-2010