

Carbenoxolone disodium

sc-203868

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Carbenoxolone disodium

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

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PRODUCT USE

■ Saponins (sapinogen glycosides) and sapogenins are widely distributed in plants. Each saponin consists of an aglucone moiety (the sapogenin), a sugar and a glycoside. The sapinogenin may be a steroid or a triterpene (unsaturated hydrocarbons based on the isoprene unit $H_2C=CH-CH=CH_2$) and with structures similar to that of steroid hormones), and the sugar may be glucose, galactose, a pentose or a methylpentose. Saponins are bitter-tasting and foam strongly when shaken in water. They form oil-in-water emulsions and act as collective colloids. They are poisonous towards lower life forms. Carbenoxolone is a derivative of enoxolone (glycyrrhetic acid) with marked anti-inflammatory actions. Appears to act locally on the stomach possibly by stimulating mucus production. Used in the treatment of peptic, mainly gastric, ulcers.

SYNONYMS

C34-H48-Na2-O7, "disodium salt of:", "olean-12-en-30-oic acid, 3-beta-hydroxy-11-oxo, hydrogen succinate, ", "olean-12-en-30-oic acid, 3-beta-hydroxy-11-oxo, hydrogen succinate, ", "3-beta-(3-carboxypropionyloxy)-11-oxo-olean-12-en-30-oic acid", "3-beta-(3-carboxypropionyloxy)-11-oxo-olean-12-en-30-oic acid", "3-(3-carboxy-1-oxypropoxy)-11-oxoolean-12-en-29-oic acid", "3-(3-carboxy-1-oxypropoxy)-11-oxoolean-12-en-29-oic acid", "3-O-(beta-carboxypropionyl)-11-oxo-18-beta-olean-12-en-30-oic acid", "3-O-(beta-carboxypropionyl)-11-oxo-18-beta-olean-12-en-30-oic acid", "3-beta-hydroxy-11-oxoolean-12-en-30-oic acid hydrogen succinate", "3-beta-hydroxy-11-oxoolean-12-en-30-oic acid hydrogen succinate", "olean-12-en-29-oic acid, 3-(3-carboxy-1-oxypropoxy)-11-oxo-, ", "olean-12-en-29-oic acid, 3-(3-carboxy-1-oxypropoxy)-11-oxo-, ", "(3-beta, 20-beta)", "(3-beta, 20-beta)", "carbenoxolone sodium", "sodium 3-beta-hydroxy-11-oxo-12-oleanen-30-oate sodium succinate", "sodium 3-beta-hydroxy-11-oxo-12-oleanen-30-oate sodium succinate", Biogastrone, Bioral, Duogastrone, Neogel, Pyrogastrone, Sanodin, "Ulcus tablinen", "glycyrrhetic acid hydrogen succinate", "18-beta-glycyrrhetic acid hydrogen succinate", "18-beta-glycyrrhetic acid hydrogen succinate", "antacid/ peptic ulcer treatment", "anti-inflammatory gastro-intestinal agent", glucocorticoid

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS

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EMERGENCY OVERVIEW

RISK

Harmful if swallowed.

Irritating to eyes.

Harmful to aquatic organisms.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.

■ Saponins (saponines and steroidal sapogenines) are weakly absorbed by the intestine and because of their detergent action, concentrate in the lipid layer of the cells of the gastric and intestinal epithelium. This results in cell damage and severe irritation of the gastrointestinal tract, characterised by burning of the mouth and stomach, cough, salivation and lachrymation, followed by nausea, vomiting, and diarrhoea. Severe fluid and electrolyte loss may also ensue. Reflexes via the autonomic nervous system may produce disturbances to heart function and circulatory system. Death may be the result of a shock reaction. Although saponins are generally poorly absorbed, local irritation of the mucous membranes may enhance their permeability as a result of damage to the intestinal wall. After absorption, systemic damage to red blood cells may produce severe haemolysis, causing anoxia and kidney failure. Humans generally do not suffer severe poisoning from saponins as endogenous cholestrin inactivates them so that only mucous membranes are involved. Because of this, saponins have been used in sneezing powders, emetics and cough syrups to facilitate expectoration. Most saponins are diuretic. In humans this effect disappears within a week following the neutralising action of cholestrin. Some saponins have been identified as potentially harmful to humans because they reduce serum cholesterol by preventing its re-adsorption after it has been excreted by the bile. It is hypothesised that the saponins either bind with bile or cause bile salts to bind to the polysaccharides in dietary fibre. Either way the bile salts are unavailable to bind cholesterol.

■ The established pharmacological actions of liquorice (licorice) and its active ingredients are similar to those of glycyrrhizic acid (the main glycoside of liquorice) and its aglycone, glycyrrhetic acid. A dose regime that gradually increased over a 10-day period, from 1 to 4 mg/kg, produced hypertension, weight increase, increase in serum sodium, decrease in serum potassium (secondary to kaliuresis (excretion of potassium in the urine) and decreases in aldosterone excretion and plasma renin activity. Subjects who habitually eat large quantities of liquorice candy (as little as 30-40 gm. per day) or whom imbibe liquorice-containing alcoholic beverages, may present with some or all of the above, in addition to oedema, bigeminy (two pulse beats in rapid succession), extrasystoles, paraesis (slight paralysis), quadriplegia, tetany (hyperexcitability of nerves and muscles due to decreases in the concentration of extracellular calcium), myoglobinuria and convulsions. Withdrawal of the substance and potassium supplementation generally results in rapid reversal of signs and symptoms.

[Gosselin, Smith and Hodge: Clinical Toxicology of Commercial Products]

Carbenoxolone (glycyrrhetic hydrogen succinate) produces heart-burn, myoglobinuria and myasthenia (muscular debility) following ingestion of the sodium salt. It may also produce sodium and water retention leading to oedema, alkalosis, hypertension, hypokalaemia and impaired glucose intolerance.

EYE

■ This material can cause eye irritation and damage in some persons.

SKIN

■ Skin contact is not thought to produce harmful health effects (as classified using animal models). Systemic harm, however, has been identified following exposure of animals by at least one other route and the material may still produce health damage following entry through wounds, lesions or abrasions. Good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

■ 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 dusts, or fume, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.

■ Inhalation of dusts, generated by the material during the course of normal handling, may be damaging to the health of the individual.

■ Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

■ Inhalation of saponin (saponin, sapogenin) dusts or aerosols may produce spasm, oedema of the larynx, chemical pneumonitis and

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pulmonary oedema. High concentrations may cause mucous membrane damage. Symptoms include burning sensation, coughing, wheezing, shortness of breath, headache and nausea.

CHRONIC HEALTH EFFECTS

■ There is limited evidence that, skin contact with this product is more likely to cause a sensitization reaction in some persons compared to the general population.

Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.

A no-effect level for glycyrrhizic acid (and its salts) of 2 mg/kg is proposed from the results of a study, from which an acceptable daily intake (ADI) of 0.2 mg/kg body weight can be extrapolated with a safety factor of 10. This means consumption of 12 mg glycyrrhizic acid/day for a person with a body weight of 60 kg. This would be equal to 6 g licorice a day, assuming that licorice contains 0.2% of glycyrrhizic acid. The proposed ADI is below the limit advised by the Dutch Nutrition Council of 200 mg glycyrrhizic acid/day. This reflects the relatively mild acute toxicity of glycyrrhizic acid, which is also emphasised by the "generally recognised as safe" (GRAS) status of glycyrrhizic acid in the USA in 1983. However, the long-term effects of a mild chronic intoxication (causing, for example, a mild hypertension), although not immediately lethal, justify special attention to the amount of glycyrrhizic acid used daily.

Several instances of allergenicity resulting from contact with steroidal saponins (sapogenins, including phytosteroids and phyto-oestrogens) have been recorded. Severe irritation has been reported following dermal exposure to sapogenin-containing saps but confounding factors such as the presence of raphides (calcium oxalates) may be significant. Saponins (saponine, sapogenine) are extremely toxic if absorbed in the blood stream; they act by haemolysis (destruction of red blood cells) even at extreme dilution. Many saponins are phytoestrogenic. A common feature of the phytoestrogens is their striking similarity to 17beta-oestradiol and the synthetic oestrogen, diethylstilboestrol. There is evidence that phytoestrogens may mediate oestrogen-like effects by direct interaction with the oestrogen receptor of cells. Although the hormonal activity of phytoestrogens is two to five orders of magnitude below that of oestradiol, their high concentration in certain plants and their slower metabolic disposition, can lead to tissue levels exceeding those of endogenous oestrogens by a factor of a thousand or more. Reversible changes in liver function have been reported in patients undergoing successive treatment courses.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

		Min	Max	
Flammability:	1			
Toxicity:	2			
Body Contact:	2			
Reactivity:	1			
Chronic:	2			
			Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4	

NAME	CAS RN	%
carbenoxolone disodium	7421-40-1	>98

Section 4 - FIRST AID MEASURES

SWALLOWED

-
- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
- For advice, contact a Poisons Information Center or a doctor.
- Urgent hospital treatment is likely to be needed.
- If conscious, give water to drink.
- INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

NOTE: Wear a protective glove when inducing vomiting by mechanical means.

- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
- If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the

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MSDS should be provided. Further action will be the responsibility of the medical specialist.

- If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

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.
- If pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

■ If skin contact occurs:

- Immediately remove all contaminated clothing, including footwear
- 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.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor.

NOTES TO PHYSICIAN

■ for poisons (where specific treatment regime is absent):

BASIC TREATMENT

- Establish a patent airway with suction where necessary.
- Watch for signs of respiratory insufficiency and assist ventilation as necessary.
- Administer oxygen by non-rebreather mask at 10 to 15 l/min.
- Monitor and treat, where necessary, for pulmonary edema .
- Monitor and treat, where necessary, for shock.
- Anticipate seizures .
- DO NOT use emetics. Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool.

ADVANCED TREATMENT

- Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.
- Positive-pressure ventilation using a bag-valve mask might be of use.
- Monitor and treat, where necessary, for arrhythmias.
- Start an IV D5W TKO. If signs of hypovolemia are present use lactated Ringers solution. Fluid overload might create complications.
- Drug therapy should be considered for pulmonary edema.
- Hypotension with signs of hypovolemia requires the cautious administration of fluids. Fluid overload might create complications.
- Treat seizures with diazepam.
- Proparacaine hydrochloride should be used to assist eye irrigation.

BRONSTEIN, A.C. and CURRANCE, P.L.

EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994.

Treat symptomatically.

for saponin (saponine, saponine) poisonings:

- Give activated charcoal by mouth, to absorb and inactivate the saponin.
- Slime preparations of rice and oats or paraffin should be given as a mucous-membrane protective.
- Substitution of electrolytes and fluid is essential after extensive episodes of vomiting and diarrhoea.
- If the patient is excited, sedatives should be given; artificial respiration may be necessary in the event of breathing arrest.
- Fatal poisonings are rare due to modern intensive care regimes.

Toxicology: Marquardt H. et al: Academic Press, 1999.

Symptoms of sodium and water retention may be relieved by a restricted sodium diet or by concomitant administration of a thiazide diuretic such as chlorothiazide, with potassium supplements.

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Absorbed from the gastro-intestinal tract, mainly in the stomach. Absorption is reduced if the gastric pH is above 2. Maximum plasma concentrations occur after 1 hour (in fasting state - food delays absorption). A second peak appears 2-3 hours later due to entero-hepatic circulation. Bound to circulation plasmas. Main excreted in the faeces via the bile. Martindale

Section 5 - FIRE FIGHTING MEASURES

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

EXTINGUISHING MEDIA

-
- Water spray or fog.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

FIRE FIGHTING

-
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

-
- Combustible solid which burns but propagates flame with difficulty.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust may burn rapidly and fiercely if ignited.
- Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
- Build-up of electrostatic charge may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO₂), other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

May emit corrosive fumes.

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:

Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

-

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- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Control personal contact by using protective equipment.
- Use dry clean up procedures and avoid generating dust.
- Place in a suitable, labelled container for waste disposal.

MAJOR SPILLS

- Moderate hazard.
- CAUTION: Advise personnel in area.
- Alert Emergency Responders and tell them location and nature of hazard.
- Control personal contact by wearing protective clothing.
- Prevent, by any means available, spillage from entering drains or water courses.
- Recover product wherever possible.
- IF DRY: Use dry clean up procedures and avoid generating dust. Collect residues and place in sealed plastic bags or other containers for disposal. IF WET: Vacuum/shovel up and place in labelled containers for disposal.
- ALWAYS: Wash area down with large amounts of water and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- - Avoid all personal contact, including inhalation.
 - Wear protective clothing when risk of exposure occurs.
 - Use in a well-ventilated area.
 - Prevent concentration in hollows and sumps.
 - DO NOT enter confined spaces until atmosphere has been checked.
 - DO NOT allow material to contact humans, exposed food or food utensils.
 - Avoid contact with incompatible materials.
 - When handling, DO NOT eat, drink or smoke.
 - Keep containers securely sealed when not in use.
 - Avoid physical damage to containers.
 - Always wash hands with soap and water after handling.
 - Work clothes should be laundered separately.
 - Launder contaminated clothing before re-use.
 - Use good occupational work practice.
 - Observe manufacturer's storing and handling recommendations.
 - Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
- Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.
- Do NOT cut, drill, grind or weld such containers.
 - In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

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RECOMMENDED STORAGE METHODS

- Glass container.
- Polyethylene or polypropylene container.
- Check all containers are clearly labelled and free from leaks.

STORAGE REQUIREMENTS

-
- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X: Must not be stored together

O: May be stored together with specific precautions

+: May be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
US - Oregon Permissible Exposure Limits (Z3)	carbenoxolone disodium (Inert or Nuisance Dust: (d) Total dust)		10						*
US OSHA Permissible Exposure Levels (PELs) - Table Z3	carbenoxolone disodium (Inert or Nuisance Dust: (d) Respirable fraction)		5						
US OSHA Permissible Exposure Levels (PELs) - Table Z3	carbenoxolone disodium (Inert or Nuisance Dust: (d) Total dust)		15						
US - Hawaii Air Contaminant Limits	carbenoxolone disodium (Particulates not otherwise regulated - Total dust)		10						
US - Hawaii Air Contaminant Limits	carbenoxolone disodium (Particulates not otherwise regulated - Respirable fraction)		5						
US - Oregon Permissible Exposure Limits (Z3)	carbenoxolone disodium (Inert or Nuisance Dust: (d) Respirable fraction)		5						*
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	carbenoxolone disodium (Particulates not otherwise regulated Respirable fraction)		5						
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	carbenoxolone disodium (Particulates not otherwise regulated (PNOR)(f)- Respirable fraction)		5						

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US - Michigan Exposure Limits for Air Contaminants	carbenoxolone disodium (Particulates not otherwise regulated, Respirable dust)	5
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MATERIAL DATA

CARBENOXOLONE DISODIUM:

■ It is the goal of the ACGIH (and other Agencies) to recommend TLVs (or their equivalent) for all substances for which there is evidence of health effects at airborne concentrations encountered in the workplace. At this time no TLV has been established, even though this material may produce adverse health effects (as evidenced in animal experiments or clinical experience). Airborne concentrations must be maintained as low as is practically possible and occupational exposure must be kept to a minimum.

NOTE: The ACGIH occupational exposure standard for Particles Not Otherwise Specified (P.N.O.S) does NOT apply.

Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-levels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on intensive odour, local irritation, and elimination half-life. However this system is being replaced to be consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.

OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

PERSONAL PROTECTION



Consult your EHS staff for recommendations

EYE

-
- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. DO NOT wear contact lenses.

HANDS/FEET

■ NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

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

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moisturiser is recommended.

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc
- polyvinyl chloride

Gloves should be examined for wear and/ or degradation constantly.

OTHER

-
- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.
-
- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

RESPIRATOR

Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
10 x PEL	P1	-	PAPR-P1
	Air-line*	-	-
50 x PEL	Air-line**	P2	PAPR-P2
100 x PEL	-	P3	-
		Air-line*	-
100+ x PEL	-	Air-line**	PAPR-P3

* - Negative pressure demand ** - Continuous flow

Explanation of Respirator Codes:

Class 1 low to medium absorption capacity filters.

Class 2 medium absorption capacity filters.

Class 3 high absorption capacity filters.

PAPR Powered Air Purifying Respirator (positive pressure) cartridge.

Type A for use against certain organic gases and vapors.

Type AX for use against low boiling point organic compounds (less than 65°C).

Type B for use against certain inorganic gases and other acid gases and vapors.

Type E for use against sulfur dioxide and other acid gases and vapors.

Type K for use against ammonia and organic ammonia derivatives

Class P1 intended for use against mechanically generated particulates of sizes most commonly encountered in industry, e.g. asbestos, silica.

Class P2 intended for use against both mechanically and thermally generated particulates, e.g. metal fume.

Class P3 intended for use against all particulates containing highly toxic materials, e.g. beryllium.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

ENGINEERING CONTROLS

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- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of:
 - (a): particle dust respirators, if necessary, combined with an absorption cartridge;
 - (b): filter respirators with absorption cartridge or canister of the right type;
 - (c): fresh-air hoods or masks
- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to efficiently remove the contaminant.

Type of Contaminant:	Air Speed:
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favorable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min) for extraction of crusher dusts generated 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.

Mixes with water.

State	Divided solid	Molecular Weight	614.7
Melting Range (°F)	Not available	Viscosity	Not Applicable
Boiling Range (°F)	Not available	Solubility in water (g/L)	Miscible
Flash Point (°F)	Not available	pH (1% solution)	7.9-8.7 (10%)
Decomposition Temp (°F)	Not available.	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available	Vapour Pressure (mmHG)	Negligible
Upper Explosive Limit (%)	Not available.	Specific Gravity (water=1)	Not available
Lower Explosive Limit (%)	Not available	Relative Vapor Density (air=1)	Not applicable
Volatile Component (%vol)	Negligible	Evaporation Rate	Not applicable

APPEARANCE

■ Saponins (sapigen glycosides) and sapogenins are widely distributed in plants. Each saponin consists of an aglucone moiety (the sapogenin), a sugar and a glycoside. The sapigenin may be a steroid or a triterpene (unsaturated hydrocarbons based on the isoprene unit

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H₂CC(CH₃)CH CH₂) and with structures similar to that of steroid hormones), and the sugar may be glucose, galactose, a pentose or a methylpentose. Saponins are bitter-tasting and foam strongly when shaken in water. They form oil-in-water emulsions and act as collective colloids. They are poisonous towards lower life forms. White or pale cream-coloured hygroscopic powder with slight sweet taste and a persistent soapy after taste; mixes with water (1:6) and alcohol (1:30).

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

-
- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerization will not occur.

STORAGE INCOMPATIBILITY

- Avoid reaction with oxidizing agents.

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

Section 11 - TOXICOLOGICAL INFORMATION

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TOXICITY AND IRRITATION

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

TOXICITY	IRRITATION
Oral (rat) LD50: 2450 mg/kg	Nil Reported
Intraperitoneal (rat) LD50: 112 mg/kg	
Subcutaneous (rat) LD50: 1515 mg/kg	

■ For glycyrrhizic acid (and its salts):

The European Commission's Scientific Committee on Food (SCF) advised that regular daily ingestion of glycyrrhizic acid and ammonium glycyrrhizate from all food products should not exceed an Upper Use Level of 100 mg/day.

A CIR Expert Panel reviewed data indicating that while glycyrrhizic acid was poorly absorbed by the intestinal tract, it was hydrolysed to glycyrrhetinic acid by a beta-glucuronidase produced by intestinal bacteria. In the blood, glycyrrhetinic acid and glycyrrhizic acid were bound to albumin and were well absorbed into tissues. Glycyrrhetinic acid and glycyrrhizic acid and metabolites were mostly excreted in the bile, with very little excreted in urine. Dipotassium glycyrrhizate was undetectable in the receptor chamber when tested for penetration through skin.

Moderate chronic or high acute exposure to glycyrrhizic acid, ammonium glycyrrhizate, and their metabolites have been demonstrated to cause transient systemic alterations including increased potassium excretion, sodium and water retention, body weight gain, alkalosis, suppression of the renin-angiotensin-aldosterone system, hypertension and muscular paralysis.

Little short-term, subchronic, or chronic toxicity were seen when ammonium, dipotassium, or disodium salts of glycyrrhizic acid were administered. Glycyrrhetinic acid was not irritating to shaved skin, but was considered slightly irritating in an in vitro test. Glycyrrhetinic acid inhibited the mutagenic activity of benzo[a]pyrene and inhibited tumor initiation and promotion by other agents. Glycyrrhizic acid inhibited tumor initiation by another agent, but did not prevent tumor promotion. Ammonium glycyrrhizate was not genotoxic in cytogenetics assays, the dominant lethal assay, a bacterial assay and heritable translocation tests. Disodium glycyrrhizate was not carcinogenic in a drinking water study at exposure levels up to 12.2 mg/kg/day for 96 weeks. Glycyrrhizate salts produced no reproductive or developmental toxicity, except for a dose-dependent increase in a skeletal variation (at 238.8 and 679.9 mg/kg/day) in one study. Sedation, hypnosis, hypothermia, and respiratory depression were seen after administration of 1250 mg/kg glycyrrhetinic acid intraperitoneally. No treatment related effects in motor function tests were seen after exposure to a powdered diet containing up to 4% ammonium glycyrrhizate, but active avoidance was facilitated at 4%, unaffected at 3%, and depressed at 2%. In a study of 39 healthy volunteers, a no effect level of 2 mg/kg/day was determined for glycyrrhizic acid given orally.

Glycyrrhetinic acid at concentrations up to 6% was not a skin irritant or a sensitizer in clinical tests. Neither glycyrrhizic acid, ammonium glycyrrhizate, nor dipotassium glycyrrhizate at 5% were phototoxic agents or photosensitizers. Birth weight and maternal blood pressure were unrelated to the level of consumption of glycyrrhizic acid in 1049 Finnish women with infants, but babies whose mother consumed greater than 500 mg/week were more likely to be born before 38 weeks.

Biochemical actions of the acid rely in part on its structural resemblance to cortisone. Animals are constantly exposed to external factors and circumstances which create stress. The endocrine system reacts to stress by secreting hormones necessary to alter metabolic processes and restore homeostasis. Glycyrrhizic acid is active in mediating the activity of at least one such hormone by inhibiting the enzyme 11beta-hydroxysteroid dehydrogenase (11HSD) which is a microsomal enzyme catalysing the reversible conversion of corticosterone to

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11-dehydrocorticosterone.. It thus appears that glycyrrhizic acts in reducing stress by increasing the body's corticosterone level by blocking the enzyme which breaks it down.

Licorice (liquorice) has been described as a "potent endocrine disrupter". This is controversial. However glycyrrhetic acid may play a role during pregnancy.. As a potent inhibitor of 11HSD enzymes and, in particular of one member of this family, "11HSD2", glycyrrhetic acid also has a key function in the regulation of foetal development and protects the foetus from the high maternal cortisol (glucocorticoid) concentrations. The intrauterine exposure to elevated levels of glucocorticoids has been associated with reduced birth weight and glucose intolerance and cardiovascular complications later in life and evidence has been provided that this programming is altered through several generations This indicates a role for epigenetic factors in the transgenerational information transfer of these alterations. The inhibition of 11HSD2 during pregnancy by glycyrrhetic acid and its analogue carbenoxolone (the hydrogen succinate) leads to elevated glucocorticoid levels and causes reduced birth weight with a higher risk for cardiovascular disease later in life The inhibition of 11HSD2 by chemicals from the environment in a critical window during pregnancy is thus expected to cause detrimental effects and should be considered as a risk factor for metabolic and cardiovascular diseases.

Data on the effects of glycyrrhizic acid in vivo are relatively limited, although this agent has been used to treat chronic viral hepatitis in Japan for many years, long-term exposure to which was aimed at preventing liver cirrhosis and hepatocellular carcinoma development. A review of the effects of liquorice on cancer pointed to its anti-inflammatory, antiviral, antiulcer and anticarcinogenesis effects

The CIR Expert Panel notes that the ingredients in this safety assessment are specific chemical species that may be isolated from the licorice plant. Because these chemicals may be isolated from plant sources, steps should be taken to assure that pesticide and toxic metal residues are below acceptable levels. Glycyrrhetic acid is described as at least 98% pure, Ammonium glycyrrhizate is at least 98% pure, and dipotassium glycyrrhizate is at least 95% pure. The CIR Expert Panel advised the industry that total PCB/pesticide contamination should be limited to not more than 40 ppm, with not more than 10 ppm for any specific residue, and that toxic metal levels must not contain more than 3 mg/kg of arsenic (as As), not more than 0.002% heavy metals, and not more than 1 mg/kg of lead (as Pb). While the CIR Expert Panel noted that glycyrrhizic acid is cytotoxic at high doses and ingestion can have physiological effects, there is little acute, short-term, subchronic, or chronic toxicity and these ingredients are poorly absorbed through the skin. These ingredients are not considered to be irritants, sensitizers, phototoxic agents, or photosensitizers at the current maximum concentration of use. Within the overall pattern of use at the time of the evaluation, the CIR Expert Panel considered all ingredients in this group to be safe.

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

CARBENOXOLONE DISODIUM:

■ Harmful to aquatic organisms.

■ Substances containing unsaturated carbons are ubiquitous in indoor environments. They result from many sources (see below). Most are reactive with environmental ozone and many produce stable products which are thought to adversely affect human health. The potential for surfaces in an enclosed space to facilitate reactions should be considered.

Source of unsaturated substances	Unsaturated substances (Reactive Emissions)	Major Stable Products produced following reaction with ozone.
Occupants (exhaled breath, ski oils, personal care products)	Isoprene, nitric oxide, squalene, unsaturated sterols, oleic acid and other unsaturated fatty acids, unsaturated oxidation products	Methacrolein, methyl vinyl ketone, nitrogen dioxide, acetone, 6MHQ, geranyl acetone, 4OPA, formaldehyde, nonanol, decanal, 9-oxo-nonanoic acid, azelaic acid, nonanoic acid.
Soft woods, wood flooring, including cypress, cedar and silver fir boards, houseplants	Isoprene, limonene, alpha-pinene, other terpenes and sesquiterpenes	Formaldehyde, 4-AMC, pinoaldehyde, pinic acid, pinonic acid, formic acid, methacrolein, methyl vinyl ketone, SOAs including ultrafine particles
Carpets and carpet backing	4-Phenylcyclohexene, 4-vinylcyclohexene, styrene, 2-ethylhexyl acrylate, unsaturated fatty acids and esters	Formaldehyde, acetaldehyde, benzaldehyde, hexanal, nonanal, 2-nonenal
Linoleum and paints/polishes containing linseed oil	Linoleic acid, linolenic acid	Propanal, hexanal, nonanal, 2-heptenal, 2-nonenal, 2-decenal, 1-pentene-3-one, propionic acid, n-butyric acid
Latex paint	Residual monomers	Formaldehyde
Certain cleaning products, polishes, waxes, air fresheners	Limonene, alpha-pinene, terpinolene, alpha-terpineol, linalool, linalyl acetate and other terpenoids, longifolene and other sesquiterpenes	Formaldehyde, acetaldehyde, glycoaldehyde, formic acid, acetic acid, hydrogen and organic peroxides, acetone, benzaldehyde, 4-hydroxy-4-methyl-5-hexen-1-al, 5-ethenyl-dihydro-5-methyl-2(3H)-furanone, 4-AMC, SOAs including ultrafine particles

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Natural rubber adhesive	Isoprene, terpenes			Formaldehyde, methacrolein, methyl vinyl ketone	
Photocopier toner, printed paper, styrene polymers	Styrene			Formaldehyde, benzaldehyde	
Environmental tobacco smoke	Styrene, acrolein, nicotine			Formaldehyde, benzaldehyde, hexanal, glyoxal, N-methylformamide, nicotinaldehyde, cotinine	
Soiled clothing, fabrics, bedding	Squalene, unsaturated sterols, oleic acid and other saturated fatty acids			Acetone, geranyl acetone, 6MHO, 40PA, formaldehyde, nonanal, decanal, 9-oxo-nonanoic acid, azelaic acid, nonanoic acid	
Soiled particle filters	Unsaturated fatty acids from plant waxes, leaf litter, and other vegetative debris; soot; diesel particles			Formaldehyde, nonanal, and other aldehydes; azelaic acid; nonanoic acid; 9-oxo-nonanoic acid and other oxo-acids; compounds with mixed functional groups (=O, -OH, and -COOH)	
Ventilation ducts and duct liners	Unsaturated fatty acids and esters, unsaturated oils, neoprene			C5 to C10 aldehydes	
"Urban grime"	Polycyclic aromatic hydrocarbons			Oxidized polycyclic aromatic hydrocarbons	
Perfumes, colognes, essential oils (e.g. lavender, eucalyptus, tea tree)	Limonene, alpha-pinene, linalool, linalyl acetate, terpinene-4-ol, gamma-terpinene			Formaldehyde, 4-AMC, acetone, 4-hydroxy-4-methyl-5-hexen-1-al, 5-ethenyl-dihydro-5-methyl-2(3H) furanone, SOAs including ultrafine particles	
Overall home emissions	Limonene, alpha-pinene, styrene			Formaldehyde, 4-AMC, pinonaldehyde, acetone, pinic acid, pinonic acid, formic acid, benzaldehyde, SOAs including ultrafine particles	

Abbreviations: 4-AMC, 4-acetyl-1-methylcyclohexene; 6MHQ, 6-methyl-5-heptene-2-one, 4OPA, 4-oxopentanal, SOA, Secondary Organic Aerosols

Reference: Charles J Weschler; Environmental Health Perspectives, Vol 114, October 2006.

■ DO NOT discharge into sewer or waterways.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

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

! Puncture containers to prevent re-use and bury at an authorized landfill.

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. 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.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

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Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 15 - REGULATORY INFORMATION

carbenoxolone disodium (CAS: 7421-40-1) is found on the following regulatory lists;

"US - Hawaii Air Contaminant Limits", "US - Oregon Permissible Exposure Limits (Z3)", "US OSHA Permissible Exposure Levels (PELs) - Table Z3"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

■ Inhalation may produce health damage*.

■ Possible skin sensitizer*.

* (limited evidence).

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■ Classification of the mixture 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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