Vitamin K1

sc-280189

Material Safety Data Sheet

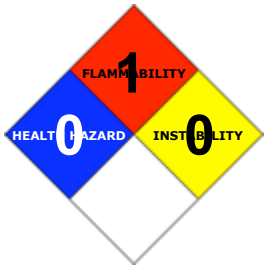
Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Vitamin K1

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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Santa Cruz, California 95060
800.457.3801 or 831.457.3800
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
C31-H46-O2, "1, 4-naphthalenedione, 2-methyl-3-(3, 7, 11, 15-tetramethyl-2-", "hexadecenyl)-[R-[R*, R*, R*-(E)]]-", "antihaemorrhagic vitamin/ antihemorrhagic protein", "2-methyl-3-(3, 7, 11, 15-tetramethyl-2-hexadecenyl)-1, 4-", naphthalenedione, "1, 4-naphthaquinone, 2-methyl-3-phytyl", "2-methyl-3-phytyl-1, 4-naphthoquinone", 3-phytylmenadione, phyllochinon, phylloquinone, alpha-phylloquinone, phytonadione, "Aqua Mephyton", "Combinal K1", "Kativ N", Kephton, Kinadion, Konakion, Mephyton, Monodion, Mono-Kay, "Synthex P", "natural product"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

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

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

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW

RISK

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Although ingestion is not thought to produce harmful effects, the material may still be damaging to the health of the individual following ingestion, especially where pre-existing organ (e.
g.

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).

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 .
■ 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

■ There is some evidence to suggest that the material can cause respiratory irritation in some persons.
The body's response to such irritation can cause further lung damage.
■ The material has NOT been classified as "harmful by inhalation".
This is because of the lack of corroborating animal or human evidence.
■ Inhalation hazard is increased at higher temperatures.
■ Acute effects from inhalation of high concentrations of vapor may be nose, throat and chest irritation with coughing, sneezing and possible nausea.

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.
Quinones may undergo a reduction reaction giving rise to a semiquinone free radical. Semiquinone metabolites are highly reactive and may interact with biological macromolecules through covalent binding. They can also transfer an electron onto molecular oxygen producing superoxide radical anions, hydrogen peroxide and other reactive oxygen species.. During this reaction, the quinone is regenerated and may undergo further enzyme-catalysed one-electron reduction. A reaction cycle is continuously activated - a "redox cycle".
Quinones may be produced from benzene, polycyclic aromatic hydrocarbons, estrogens, and catecholamines and give rise to reactive oxygen species that can damage DNA and other cellular macromolecules and activate signaling pathways. These molecular events may be associated with the initiation, promotion, and progression of carcinogenesis
The capacity of quinone derivatives to produce free radicals is largely influenced by the substituents on the molecule which in turn determine the efficiency of one electron reduction to semiquinone metabolites.
Oxygen activation (generation of a superoxide) occurs during one of the reactions of this metabolic sequence. Superoxide is a strong base and can therefore attract protons from a variety of compounds; it is also a potent reducing agent which can reduce transition metal ions (such as Fe3+ and Cu+) to their reduced form Superoxide may also act as a nucleophile and may readily react with a number of electrophilic agents. Finally superoxide may initiate oxidation reactions, for example, of molecules such as ascorbic acid or epinephrine (adrenaline) following hydrogen abstraction due to its basicity.
Under certain conditions the rate of formation of reactive oxygen species may exceed the capacity of the bodies auto-oxidative defence mechanisms and, as a result, result in "oxidative stress'". Oxidative stress appears to be involved in some biological processes such as aging and inflammation reactions and is thought to play a role in the pathogenesis of several diseases, including acute pancreatitis, post-ischaemic syndrome,tumour formation, atherosclerosis and diabetic angiopathy.
Free radicals can react with specific cellular molecules including low molecular weight biomolecules such as neurotransmitters and co-enzymes and, as a consequence, inactivate them. macromolecules and cellular membranes are particularly vulnerable to free radical damage with the resultant loss of physiological function and cell death Depolymerisation of polysaccharides (such as hyaluronic acid) may result in inflammation of the joints.
Free radicals have a high affinity for sulfur containing amino-acids and therefore many proteins. The may bind covalently to these proteins leading to loss, of biological function such as catalysis exhibited by enzymes. Covalent binding may also result in allergic reactions when the modified protein is recognised, by the bodies immune system, as "foreign" Free radicals are also capable of causing proteins to cross-link to yield larger aggregates.

Free radicals are also able to react with the nucleic acids of DNA which may affect cell division or cell death Oxidative modifications of DNA may result in tumour initiation.
Lipids containing several double bonds (such as polyunsaturated fatty acids and cholesterol) are also subject to damage. In the case of membrane phospholipids, such "peroxidation" results in impairment of cellular and/ or subcellular membranes which may produce cell death. Transition metal ions may also play an important role in lipid peroxidation after free radical-induced change of valency . Fe3+/Fe2+, copper and mercury ions, as well as vanadate and chromate ions seem to initiate this process and may even exacerbate it by producing secondary radicals when the phospholipid is modified.
Intravenous administration of phytomenadione (Vitamin K1) has caused reactions, including altered sensations of taste, flushing of the face, sweating, bronchospasm, tachycardia and hypotension. It has been suggested that the vehicle carrying the Vitamin may be responsible
Deficiency of Vitamin K produces hypoprothrombinaemia in which the clotting time of blood is prolonged and spontaneous haemorrhage may occur. Deficiency may result from poor intestinal absorption, from obstructive jaundice or severe liver disease or from the administration of coumarin or indanedione anticoagulants which interfere with Vitamin K metabolism.
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Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
phytomenadione	84-80-0	>98

Section 4 - FIRST AID MEASURES

SWALLOWED
· Immediately give a glass of water. · First aid is not generally required. If in doubt, contact a Poisons Information Center or a doctor.
EYE
■ If this product comes in contact with eyes: · Wash out immediately with water. · If irritation continues, seek medical attention.
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. · Other measures are usually unnecessary.

NOTES TO PHYSICIAN
■ Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Negligible
Upper Explosive Limit (%):	Not available.
Specific Gravity (water=1):	0.984
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.
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.
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:

Type A-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
· Clean up waste regularly and abnormal spills immediately.
· Avoid breathing dust and contact with skin and eyes.
· Wear protective clothing, gloves, safety glasses and dust respirator.
· Use dry clean up procedures and avoid generating dust.
· Vacuum up or sweep up. NOTE: Vacuum cleaner must be fitted with an exhaust micro filter (HEPA type) (consider explosion-proof machines designed to be grounded during storage and use).
· Dampen with water to prevent dusting before sweeping.
· Place in suitable containers for disposal.
MAJOR SPILLS
■ 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
■ Glass container.
· Metal can or drum
· Packing as recommended by manufacturer.

STORAGE REQUIREMENTS
· Store in original containers.
· Keep containers securely sealed.
· No smoking, naked lights or ignition sources.
· 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.
NOTE: Decomposes in sunlight.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - British Columbia Occupational Exposure Limits	phytomenadione (Turpentine and selected monoterpenes Revised 2003)	20							S
Canada - Alberta Occupational Exposure Limits	phytomenadione (Turpentine and selected monoterpenes)	20	111						

ENDOELTABLE

PERSONAL PROTECTION




RESPIRATOR

•Type A-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

EYE

■ When handling very small quantities of the material eye protection may not be required.
For laboratory, larger scale or bulk handling or where regular exposure in an occupational setting occurs:
· Chemical goggles
· Face shield. Full face shield may be required for supplementary but never for primary protection of eyes
· Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent].

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, AS/NZS 2161.1 or national equivalent).
· 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, AS/NZS 2161.10.1 or national equivalent) 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, AS/NZS 2161.10.1 or national equivalent) 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.
· Rubber gloves (nitrile or low-protein, powder-free latex). Employees allergic to latex gloves should use nitrile gloves in preference.
· Double gloving should be considered.
· PVC gloves.
· Protective shoe covers. [AS/NZS 2210]
· Head covering.
· Polyethylene gloves.

OTHER

· For quantities up to 500 grams a laboratory coat may be suitable.
· For quantities up to 1 kilogram a disposable laboratory coat or coverall of low permeability is recommended. Coveralls should be buttoned at collar and cuffs.
· For quantities over 1 kilogram and manufacturing operations, wear disposable coverall of low permeability and disposable shoe covers.
· For manufacturing operations, air-supplied full body suits may be required for the provision of advanced respiratory protection.
· Eye wash unit.
· Ensure there is ready access to an emergency shower.
· For Emergencies: Vinyl suit.

ENGINEERING CONTROLS

■ Enclosed local exhaust ventilation is required at points of dust, fume or vapor generation.
HEPA terminated local exhaust ventilation should be considered at point of generation of dust, fumes or vapors.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.
Does not mix with water.
Floats on water.

State	Liquid	Molecular Weight	450.68
Melting Range (°F)	-4	Viscosity	Not Applicable
Boiling Range (°F)	Not applicable.	Solubility in water (g/L)	Immiscible

Flash Point (°F)	>230	pH (1% solution)	Not applicable
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)	0.984
Lower Explosive Limit (%)	Not available.	Relative Vapor Density (air=1)	Not Applicable
Volatile Component (%vol)	Negligible	Evaporation Rate	Not Applicable

APPEARANCE
Clear yellow to amber, very viscous oil with no odour; does not mix with water. Soluble in ethanol, acetone, benzene, petroleum ether, hexane, dioxane, chloroform, ether, other fat solvents and in vegetable oils.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY
· Presence of incompatible materials.
· Product is considered stable.

STORAGE INCOMPATIBILITY
■ Avoid storage with reducing agents.
· Avoid strong bases.
· Protect from light.

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

Section 11 - TOXICOLOGICAL INFORMATION

phytomenadione

TOXICITY AND IRRITATION
PHYTOMENADIONE:
■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (mouse) LD50: 25000 mg/kg	Nil Reported
Intravenous (mouse) LD50: >6750 mg/kg	

■ Biologically active naphthoquinones readily pass through the cellular membranes where their electrophilicity enables them to conjugate with other compounds. This reaction has been implicated in the toxicity of quinones. Nucleophilic targets include thiol groups which results in inhibition of enzymes such as parvulin-like peptidyl-prolyl cis/trans isomerases, glutathione-S-transferase and cardiac sarcoplasmic reticulum Ca2+ ATPase
The toxicity of quinone compounds has been extensively studied and is generally accepted to be a function of (a) the capacity of quinones to produce oxygen free radicals and (b) the electrophilicity of quinones, which enables them to form adducts to cellular macromolecules.In vitro experiments designed to examine the relative rates of enzymatic single-electron reduction demonstrated that naphthoquinones, especially juglone, undergo rapid single-electron reduction.
Unsubstituted naphthoquinones generally do not show mutagenicity in the Salmonella mutation assay in the presence or absence of S-9 metabolic activation. However, substituted naphthoquinones containing one or more hydroxyl groups
and/or methoxyl groups have been shown to be mutagenic in S. typhimurium in the presence of S-9.
Naphthoquinone derivatives have significant pharmacological properties. They are cytotoxic, they have significant antibacterial, antifungal, antiviral, insecticidal, anti-inflammatory, and antipyretic properties. Plants with naphthoquinone content are widely used in China and the countries of South America, where they are used to treat malignant and parasitic diseases.

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.

CARCINOGEN

PBIT_(PERS~	US - Maine Chemicals of High Concern List	Carcinogen

Section 12 - ECOLOGICAL INFORMATION

No data

Ecotoxicity

Ingredient	Persistence:	Persistence: Air	Bioaccumulation	Mobility

	Water/Soil			
phytomenadione	HIGH	No Data Available	LOW	LOW

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / EHS TRN A1a A1b A1 A2 B1 B2 C1 C2 C3 D1 D2 D3 E1 E2 E3 Cas No / RTECS No _____ Poly(2+)c 224 574 4 4 NR (4) NI (1) (1) (2) (1) (1) CM S 3 yclic 6 aromatics / CAS:84- 80- 0 /

Legend: EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships) NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation, B1=Acuteaquatic toxicity LC/ECIC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg), C2=Acutemammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion, D2=Eye irritation& corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference with coastal amenities, For column A2: R=Readily biodegradable, NR=Not readily biodegradable. For column D3: C=Carcinogen, M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lunginjury, N=Neurotoxic, I=Immunotoxic. For column E1: NT=Not tainting (tested), T=Tainting test positive. For column E2: Fp=Persistent floater, F=Floater, S=Sinking substances. The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard. (GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships)

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

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

Section 15 - REGULATORY INFORMATION

phytomenadione (CAS: 84-80-0) is found on the following regulatory lists;
"Canada Domestic Substances List (DSL)","US - New Jersey Right to Know Hazardous Substances","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE
■ Cumulative effects may result following exposure*.
■ May produce discomfort of the respiratory system*.
■ Limited evidence of a carcinogenic effect*.
* (limited evidence).

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

■ 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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