

## Troy Proden PlaqueOff Powder for Cats

Troy Laboratories Pty Ltd

Chemwatch Hazard Alert Code: 2

Chemwatch: 5398-93

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Safety Data Sheet according to WHS and ADG requirements

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### SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

#### Product Identifier

Product name	Troy Proden PlaqueOff Powder for Cats
Synonyms	Not Available
Other means of identification	Not Available

#### Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Helps reduce plaque, tartar and bad breath. To be used as directed on product label.
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#### Details of the supplier of the safety data sheet

Registered company name	Troy Laboratories Pty Ltd
Address	37 Glendenning Road Glendenning NSW 2761 Australia
Telephone	02 8808 3600
Fax	02 9677 9300
Website	www.Troylab.com.au
Email	admin@troylab.com.au

#### Emergency telephone number


Association / Organisation	Troy Laboratories Pty Ltd
Emergency telephone numbers	02 8808 3600 (Office hours (8am – 4pm, Monday to Friday))
Other emergency telephone numbers	Not Available

### SECTION 2 HAZARDS IDENTIFICATION

#### Classification of the substance or mixture

Poisons Schedule	Not Applicable
Classification [1]	Skin Sensitizer Category 1
Legend:	1. Classified by Chemwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI

#### Label elements

Hazard pictogram(s)	
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SIGNAL WORD	<b>WARNING</b>
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#### Hazard statement(s)

H317	May cause an allergic skin reaction.
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#### Precautionary statement(s) Prevention

P280	Wear protective gloves/protective clothing/eye protection/face protection.
P261	Avoid breathing dust/fumes.
P272	Contaminated work clothing should not be allowed out of the workplace.

#### Precautionary statement(s) Response

P321	Specific treatment (see advice on this label).
P363	Wash contaminated clothing before reuse.
P302+P352	IF ON SKIN: Wash with plenty of water and soap.

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P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
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**Precautionary statement(s) Storage**

Not Applicable

**Precautionary statement(s) Disposal**

P501	Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.
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**SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS****Substances**

See section below for composition of Mixtures

**Mixtures**

CAS No	%[weight]	Name
69235-69-4	>60	<u>kelp extract (Ascophyllum nodosum)</u>
Not Available	balance	Ingredients determined not to be hazardous

**SECTION 4 FIRST AID MEASURES****Description of first aid measures**

<b>Eye Contact</b>	<p>If this product comes in contact with the eyes:</p> <ul style="list-style-type: none"> <li>▶ Immediately hold eyelids apart and flush the eye continuously with running water.</li> <li>▶ 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.</li> <li>▶ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.</li> <li>▶ Transport to hospital or doctor without delay.</li> <li>▶ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.</li> </ul>
<b>Skin Contact</b>	<p>If skin contact occurs:</p> <ul style="list-style-type: none"> <li>▶ Immediately remove all contaminated clothing, including footwear.</li> <li>▶ Flush skin and hair with running water (and soap if available).</li> <li>▶ Seek medical attention in event of irritation.</li> </ul>
<b>Inhalation</b>	<ul style="list-style-type: none"> <li>▶ If fumes, aerosols or combustion products are inhaled remove from contaminated area.</li> <li>▶ Other measures are usually unnecessary.</li> </ul>
<b>Ingestion</b>	<ul style="list-style-type: none"> <li>▶ Immediately give a glass of water.</li> <li>▶ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.</li> </ul>

**Indication of any immediate medical attention and special treatment needed**

Treat symptomatically.

**SECTION 5 FIREFIGHTING MEASURES****Extinguishing media**

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

**Special hazards arising from the substrate or mixture**

<b>Fire Incompatibility</b>	▶ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result
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**Advice for firefighters**

<b>Fire Fighting</b>	<ul style="list-style-type: none"> <li>▶ Alert Fire Brigade and tell them location and nature of hazard.</li> <li>▶ Wear breathing apparatus plus protective gloves.</li> <li>▶ Prevent, by any means available, spillage from entering drains or water courses.</li> <li>▶ Use water delivered as a fine spray to control fire and cool adjacent area.</li> <li>▶ <b>DO NOT</b> approach containers suspected to be hot.</li> <li>▶ Cool fire exposed containers with water spray from a protected location.</li> <li>▶ If safe to do so, remove containers from path of fire.</li> <li>▶ Equipment should be thoroughly decontaminated after use.</li> </ul>
<b>Fire/Explosion Hazard</b>	<ul style="list-style-type: none"> <li>▶ Combustible solid which burns but propagates flame with difficulty; it is estimated that most organic dusts are combustible (circa 70%) - according to the circumstances under which the combustion process occurs, such materials may cause fires and / or dust explosions.</li> <li>▶ Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions).</li> <li>▶ 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 (420 micron or less) may burn rapidly and fiercely if ignited - particles exceeding this limit will generally not form flammable dust clouds; once initiated, however, larger particles up to 1400 microns diameter will contribute to the propagation of an explosion.</li> <li>▶ In the same way as gases and vapours, dusts in the form of a cloud are only ignitable over a range of concentrations; in principle, the concepts of lower explosive limit (LEL) and upper explosive limit (UEL) are applicable to dust clouds but only the LEL is of practical use; - this is because of the inherent difficulty of achieving homogeneous dust clouds at high temperatures (for dusts the LEL is often called the "Minimum Explosible Concentration", MEC).</li> </ul>

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	<ul style="list-style-type: none"> <li>▶ When processed with flammable liquids/vapors/mists, ignitable (hybrid) mixtures may be formed with combustible dusts. Ignitable mixtures will increase the rate of explosion pressure rise and the Minimum Ignition Energy (the minimum amount of energy required to ignite dust clouds - MIE) will be lower than the pure dust in air mixture. The Lower Explosive Limit (LEL) of the vapour/dust mixture will be lower than the individual LELs for the vapors/mists or dusts.</li> <li>▶ A dust explosion may release of large quantities of gaseous products; this in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people.</li> <li>▶ Usually the initial or primary explosion takes place in a confined space such as plant or machinery, and can be of sufficient force to damage or rupture the plant. If the shock wave from the primary explosion enters the surrounding area, it will disturb any settled dust layers, forming a second dust cloud, and often initiate a much larger secondary explosion. All large scale explosions have resulted from chain reactions of this type.</li> <li>▶ Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.</li> <li>▶ Build-up of electrostatic charge may be prevented by bonding and grounding.</li> <li>▶ Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.</li> <li>▶ All movable parts coming in contact with this material should have a speed of less than 1-meter/sec.</li> <li>▶ A sudden release of statically charged materials from storage or process equipment, particularly at elevated temperatures and/ or pressure, may result in ignition especially in the absence of an apparent ignition source.</li> <li>▶ One important effect of the particulate nature of powders is that the surface area and surface structure (and often moisture content) can vary widely from sample to sample, depending of how the powder was manufactured and handled; this means that it is virtually impossible to use flammability data published in the literature for dusts (in contrast to that published for gases and vapours).</li> <li>▶ Autoignition temperatures are often quoted for dust clouds (minimum ignition temperature (MIT)) and dust layers (layer ignition temperature (LIT)); LIT generally falls as the thickness of the layer increases.</li> </ul> <p>Combustion products include:  carbon monoxide (CO)  carbon dioxide (CO<sub>2</sub>)  hydrogen iodide  nitrogen oxides (NO<sub>x</sub>)  sulfur oxides (SO<sub>x</sub>)  other pyrolysis products typical of burning organic material.</p>
HAZCHEM	Not Applicable

## SECTION 6 ACCIDENTAL RELEASE MEASURES

## Personal precautions, protective equipment and emergency procedures

See section 8

## Environmental precautions

See section 12

## Methods and material for containment and cleaning up

Minor Spills	<ul style="list-style-type: none"> <li>▶ Clean up all spills immediately.</li> <li>▶ Avoid breathing dust and contact with skin and eyes.</li> <li>▶ Wear protective clothing, gloves, safety glasses and dust respirator.</li> <li>▶ Use dry clean up procedures and avoid generating dust.</li> <li>▶ Sweep up, shovel up or</li> <li>▶ Vacuum up (consider explosion-proof machines designed to be grounded during storage and use).</li> <li>▶ Place spilled material in clean, dry, sealable, labelled container.</li> </ul>
Major Spills	<p>Moderate hazard.</p> <ul style="list-style-type: none"> <li>▶ <b>CAUTION:</b> Advise personnel in area.</li> <li>▶ Alert Emergency Services and tell them location and nature of hazard.</li> <li>▶ Control personal contact by wearing protective clothing.</li> <li>▶ Prevent, by any means available, spillage from entering drains or water courses.</li> <li>▶ Recover product wherever possible.</li> <li>▶ <b>IF DRY:</b> Use dry clean up procedures and avoid generating dust. Collect residues and place in sealed plastic bags or other containers for disposal. <b>IF WET:</b> Vacuum/shovel up and place in labelled containers for disposal.</li> <li>▶ <b>ALWAYS:</b> Wash area down with large amounts of water and prevent runoff into drains.</li> <li>▶ If contamination of drains or waterways occurs, advise Emergency Services.</li> </ul>

Personal Protective Equipment advice is contained in Section 8 of the SDS.

## SECTION 7 HANDLING AND STORAGE

## Precautions for safe handling

Safe handling	<ul style="list-style-type: none"> <li>▶ Avoid all personal contact, including inhalation.</li> <li>▶ Wear protective clothing when risk of exposure occurs.</li> <li>▶ Use in a well-ventilated area.</li> <li>▶ Prevent concentration in hollows and sumps.</li> <li>▶ <b>DO NOT enter confined spaces until atmosphere has been checked.</b></li> <li>▶ <b>DO NOT allow material to contact humans, exposed food or food utensils.</b></li> <li>▶ Avoid contact with incompatible materials.</li> <li>▶ <b>When handling, DO NOT eat, drink or smoke.</b></li> <li>▶ Keep containers securely sealed when not in use.</li> <li>▶ Avoid physical damage to containers.</li> <li>▶ Always wash hands with soap and water after handling.</li> <li>▶ Work clothes should be laundered separately. Launder contaminated clothing before re-use.</li> <li>▶ Use good occupational work practice.</li> <li>▶ Observe manufacturer's storage and handling recommendations contained within this SDS.</li> <li>▶ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.</li> </ul>
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## Other information

- ▶ Store in original containers.
- ▶ Keep containers securely sealed.
- ▶ Store in a cool, dry area protected from environmental extremes.
- ▶ Store away from incompatible materials and foodstuff containers.
- ▶ Protect containers against physical damage and check regularly for leaks.
- ▶ Observe manufacturer's storage and handling recommendations contained within this SDS.

For major quantities:

- ▶ Consider storage in banded areas - ensure storage areas are isolated from sources of community water (including stormwater, ground water, lakes and streams).
- ▶ Ensure that accidental discharge to air or water is the subject of a contingency disaster management plan; this may require consultation with local authorities.

## Conditions for safe storage, including any incompatibilities

## Suitable container

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

## Storage incompatibility

- ▶ Avoid reaction with oxidising agents

## SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

## Control parameters

## OCCUPATIONAL EXPOSURE LIMITS (OEL)

## INGREDIENT DATA

Not Available

## EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
Troy Proden PlaqueOff Powder for Cats	Not Available	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
kelp extract (Ascophyllum nodosum)	Not Available	Not Available

## OCCUPATIONAL EXPOSURE BANDING

Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
kelp extract (Ascophyllum nodosum)	D	> 0.01 to ≤ 0.1 mg/m <sup>3</sup>

## Notes:

Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.

## MATERIAL DATA

## Exposure controls

## Appropriate engineering controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

The basic types of engineering controls are:

Process controls which involve changing the way a job activity or process is done to reduce the risk.

Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.

Employers may need to use multiple types of controls to prevent employee overexposure.

- ▶ 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.)
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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.)
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Within each range the appropriate value depends on:

Lower end of the range

Upper end of the range

1: Room air currents minimal or favourable 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

	<p>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 metres 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.</p>
<b>Personal protection</b>	
<b>Eye and face protection</b>	<ul style="list-style-type: none"> <li>▶ Safety glasses with side shields.</li> <li>▶ Chemical goggles.</li> <li>▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses 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]</li> </ul>
<b>Skin protection</b>	See Hand protection below
<b>Hands/feet protection</b>	<p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>▶ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.</li> <li>▶ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.</li> </ul> <p>The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.</p> <p>The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.</p> <p>Personal hygiene is a key element of effective hand care. 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.</p> <p>Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:</p> <ul style="list-style-type: none"> <li>- frequency and duration of contact,</li> <li>- chemical resistance of glove material,</li> <li>- glove thickness and</li> <li>- dexterity</li> </ul> <p>Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).</p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- 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.</li> <li>- Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use.</li> <li>- Contaminated gloves should be replaced.</li> </ul> <p>As defined in ASTM F-739-96 in any application, gloves are rated as:</p> <ul style="list-style-type: none"> <li>- Excellent when breakthrough time &gt; 480 min</li> <li>- Good when breakthrough time &gt; 20 min</li> <li>- Fair when breakthrough time &lt; 20 min</li> <li>- Poor when glove material degrades</li> </ul> <p>For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.</p> <p>It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.</p> <p>Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers' technical data should always be taken into account to ensure selection of the most appropriate glove for the task.</p> <p>Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:</p> <ul style="list-style-type: none"> <li>- Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of.</li> <li>- Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential</li> </ul> <p>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.</p> <p>Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.</p> <ul style="list-style-type: none"> <li>▶ polychloroprene.</li> <li>▶ nitrile rubber.</li> <li>▶ butyl rubber.</li> <li>▶ fluoroacoutchouc.</li> <li>▶ polyvinyl chloride.</li> </ul> <p>Gloves should be examined for wear and/ or degradation constantly.</p>
<b>Body protection</b>	See Other protection below
<b>Other protection</b>	<ul style="list-style-type: none"> <li>▶ Overalls.</li> <li>▶ P.V.C. apron.</li> <li>▶ Barrier cream.</li> <li>▶ Skin cleansing cream.</li> <li>▶ Eye wash unit.</li> </ul>

**Respiratory protection**

Particulate. (AS/NZS 1716 &amp; 1715, EN 143:2000 &amp; 149:001, ANSI Z88 or national equivalent)

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
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up to 10 x ES	P1 Air-line*	- -	PAPR-P1 -
up to 50 x ES	Air-line**	P2	PAPR-P2
up to 100 x ES	-	P3	-
		Air-line*	-
100+ x ES	-	Air-line**	PAPR-P3

\* - Negative pressure demand \*\* - Continuous flow

A(All classes) = Organic vapours, B AUS or B1 = Acid gases, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO<sub>2</sub>), G = Agricultural chemicals, K = Ammonia(NH<sub>3</sub>), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- ▶ 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 protection. 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.

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

## Information on basic physical and chemical properties

<b>Appearance</b>	Olive coloured powder with characteristic odour; insoluble in water.		
<b>Physical state</b>	Divided Solid	<b>Relative density (Water = 1)</b>	Not Available
<b>Odour</b>	Not Available	<b>Partition coefficient n-octanol / water</b>	Not Available
<b>Odour threshold</b>	Not Available	<b>Auto-ignition temperature (°C)</b>	Not Available
<b>pH (as supplied)</b>	Not Applicable	<b>Decomposition temperature</b>	Not Available
<b>Melting point / freezing point (°C)</b>	Not Available	<b>Viscosity (cSt)</b>	Not Applicable
<b>Initial boiling point and boiling range (°C)</b>	Not Available	<b>Molecular weight (g/mol)</b>	Not Applicable
<b>Flash point (°C)</b>	Not Available	<b>Taste</b>	Not Available
<b>Evaporation rate</b>	Not Applicable	<b>Explosive properties</b>	Not Available
<b>Flammability</b>	Not Available	<b>Oxidising properties</b>	Not Available
<b>Upper Explosive Limit (%)</b>	Not Available	<b>Surface Tension (dyn/cm or mN/m)</b>	Not Applicable
<b>Lower Explosive Limit (%)</b>	Not Available	<b>Volatile Component (%vol)</b>	Not Available
<b>Vapour pressure (kPa)</b>	Not Applicable	<b>Gas group</b>	Not Available
<b>Solubility in water</b>	Immiscible	<b>pH as a solution (1%)</b>	Not Applicable
<b>Vapour density (Air = 1)</b>	Not Available	<b>VOC g/L</b>	Not Available

## SECTION 10 STABILITY AND REACTIVITY

<b>Reactivity</b>	See section 7
<b>Chemical stability</b>	<ul style="list-style-type: none"> <li>▶ Unstable in the presence of incompatible materials.</li> <li>▶ Product is considered stable.</li> <li>▶ Hazardous polymerisation will not occur.</li> </ul>
<b>Possibility of hazardous reactions</b>	See section 7
<b>Conditions to avoid</b>	See section 7
<b>Incompatible materials</b>	See section 7
<b>Hazardous decomposition products</b>	See section 5

## SECTION 11 TOXICOLOGICAL INFORMATION

## Information on toxicological effects

<b>Inhaled</b>	The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
<b>Ingestion</b>	The material has <b>NOT</b> been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.

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<b>Skin Contact</b>	Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.	
<b>Eye</b>	Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).	
<b>Chronic</b>	Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.	
<b>Troy Proden PlaqueOff Powder for Cats</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Not Available	Not Available
<b>kelp extract (Ascophyllum nodosum)</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Not Available	Not Available
<b>Legend:</b>	1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances	

<b>KELP EXTRACT (ASCOPHYLLUM NODOSUM)</b>	<p>The following information refers to contact allergens as a group and may not be specific to this product.</p> <p>Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.</p> <p>No significant acute toxicological data identified in literature search.</p> <p>The Cosmetic Ingredient Review (CIR) Expert Panel (Panel) assessed the safety of 82 brown algae-derived ingredients, which are frequently reported to function in cosmetics as skin-conditioning agents. The Panel concluded that the following 6 of the 82 reviewed brown algae-derived ingredients are safe in cosmetics in the present practices of use and concentration and also concluded that the available data are insufficient to make a determination that the remaining 76 ingredients are safe under the intended conditions of use in cosmetic formulations</p> <p>"Kelp" (the dehydrated, ground product prepared from <i>Macrocystis pyrifera</i>, <i>Laminaria digitata</i>, <i>Laminaria saccharina</i>, and <i>Laminaria cloustoni</i>) is approved as a food additive for direct addition to food for human consumption as a source of iodine or as a dietary supplement. In animal drugs, feeds, and related products, brown algae (kelp; <i>Laminaria</i> spp. and <i>Nereocystis</i> spp.) are generally regarded as safe (GRAS) as natural substances and as solvent-free natural extractives used in conjunction with spices and other natural seasonings and flavourings.</p> <p>Extraction methods and solvents vary, depending on the desired composition of the final ingredient. Powders, however, are generally the dried algae pulverized by milling. Inorganic arsenic, usually in the form of arsenosugars, is a natural constituent of brown algae and the amount in the harvested algae can be reduced by several methods. In addition to arsenic, brown algae exhibit an affinity for heavy metals and uptake is strongly dependent on environmental parameters.</p> <p>Several brown algae constituents, such as phytosterols, phytosteryl ingredients, and alginic acid were previously found to be safe</p> <p><b>Toxicity:</b></p> <p>In oral human clinical trials, adverse effects of an <i>Ascophyllum nodosum</i> powder (0.5 g/d), an <i>Ecklonia cava</i> extract (up to 400 mg/day), and an <i>Undaria pinnatifida</i> powder (average intake 3.3 g per day) were mild and transient. The adverse effects included nausea, indigestion, dyspepsia, and diarrhea.</p> <p>Acute oral administration of brown algae extracts was not toxic to mice, rats, and dogs. <i>Cystoseira Compressa</i> Extract was not toxic to mice up to 2000 mg/kg by gavage. <i>Ecklonia Cava</i> Extract was not toxic to rats and dogs up to 3000 mg/kg by gavage. The oral LD50s of two different <i>Fucus Vesiculosus</i> Extracts were 500 mg/kg and greater for mice and rats. There were no signs of toxicity at up to 4000 mg/kg <i>Laminaria Japonica</i> Extract orally administered to rats. <i>Sargassum Fulvellum</i> Extract and <i>Sargassum Thunbergii</i> Extract administered by gavage were not toxic to mice.</p> <p>In oral short-term and subchronic studies, there were some adverse effects observed. In rats, <i>Cladosiphon Okamuranus</i> Extract (1200 to 4000 mg/kg by gavage) caused a dose-dependent increase in clotting time and decrease in alkaline phosphatase (ALP); there were no other adverse effects reported. An enzyme extract of <i>Ecklonia Cava</i> Extract (starting at 2000 mg/kg) administered by gavage for 2 weeks caused reduced ovary and brain weights in female rats. Hepatic effects in rats were observed in an alcohol <i>Ecklonia Cava</i> Extract at 2000 mg/kg/day for 4 weeks and at 1500 mg/kg/day when administered for 13 weeks (the hepatic effects resolved after 4 weeks of recovery). There were increased liver weights in male rats treated with two ethanol <i>Fucus Vesiculosus</i> Extracts (starting at 200 mg/kg/day) administered by gavage for 4 weeks.</p> <p>Vomiting was the only adverse effect when <i>Ecklonia Cava</i> Extract capsules (in increasing amounts up to 1000 mg/kg over 8 days) were orally administered to dogs. In other oral short-term and subchronic studies, there no adverse effects observed. <i>Ascophyllum Nodosum</i> was not toxic to pigs for 23 days or to rats for 4 weeks administered in feed at up to 10% and 15%, respectively. While consuming high-fat diets, there were no adverse effects caused by alcohol <i>Ecklonia Cava</i> Extract (up to 5 mg/day) administered to mice by gavage daily for 4 weeks and an ethanol <i>Laminaria Japonica</i> Extract (up to 400 mg/kg) administered by gavage for 6 weeks caused decreased body weight gain, fat-pad weights, and serum and hepatic lipid levels in rats. A <i>Ecklonia cava</i> powder (up to 0.15%; inference for <i>Ecklonia Cava</i> Extract and <i>Ecklonia Cava</i> Water) administered in feed for 28 days was not toxic to weanling pigs. An orally administered <i>Undaria pinnatifida</i> extract for 28 days was not toxic to rats up to 1000 mg/kg/day, but ALT and triglyceride levels in males and HDL cholesterol in females increased at 2000 mg/kg/day. In a chronic oral toxicity study, the NOAEL of a <i>Laminaria Japonica</i> Extract administered to rats by gavage for 6 months was 300 mg/kg/day. In females, a decrease in AST was observed starting at 300 mg/kg/day and, at 2500 mg/kg/day, there was decreased serum glucose concentration; all effects returned to baseline after a 1-month recovery. <i>Laminaria Japonica</i> Powder incorporated into feed did not affect the lifespan of mice at up to 5%.</p> <p>In rats, <i>Undaria Pinnatifida</i> Extract administered as drinking water at 100% for 32 weeks and incorporated into the feed (at up to 5%) for 36 weeks did not cause any toxic effects.</p> <p><b>Genetic toxicity:</b></p> <p>In genotoxicity assays of several of the brown algae-derived ingredients, all results were negative with the exception of an <i>Ascophyllum Nodosum</i> Extract in one mammalian cell gene mutation test in which the extract was genotoxic starting at 1500 ug/ml in CHO cells. <i>Ascophyllum Nodosum</i> Extract was not genotoxic in an Ames assay and a mammalian cell gene mutation test (up to 500 ug/ml), and in chromosome aberration assays (up to 5 mg/ml). <i>Cystoseira Compressa</i> Extract (up to 5 mg/plate) was not genotoxic in an Ames assay. <i>Ecklonia Cava</i> Extract was not genotoxic in Ames assays (up to 5000 ug/plate) and chromosome aberration assays (up to 350 ug/plate). Aqueous <i>Fucus Vesiculosus</i> Extract was not genotoxic in a chromosome aberration assay and a comet assay (up to 1 mg/ml). <i>Laminaria Japonica</i> Extract (up to 5000 ug/plate) was not mutagenic in an Ames assay and a chromosome aberration assay. <i>Undaria Pinnatifida</i> Extract was not genotoxic in Ames assays and chromosome aberration assays (up to 5000 ug/ml). In micronucleus assays, <i>Ecklonia Cava</i> Extract (up to 3000 mg/kg), <i>Laminaria Japonica</i> Extract (up to 2000 mg/kg), and <i>Undaria Pinnatifida</i> Extract (up to 2000 mg/kg) were not genotoxic. An Ames test was performed according to OECD TG 471 using a trade name mixture containing 4.7% <i>Ascophyllum Nodosum</i> Extract in 94.5% water. No mutagenic activity was reported. None of the orally or dermally administered brown algae-derived ingredients tested (e.g., <i>Hizikia Fusiforme</i> Extract, <i>Saccharina Angustata</i> Extract (inference from <i>Saccharina Angustata</i> powder), <i>Undaria Pinnatifida</i> Extract, and <i>Undaria Pinnatifida</i> Powder) were tumor (mammary and colorectal) promoters; instead, decreases in the number, incidence, and/or size of tumors in rats were reported. Rats administered methylnitrosoguanidine (MNNG) followed by 8 weeks of <i>Sargassum Pallidum</i> Extract (400 to 800 mg/kg/day) in drinking water exhibited decreased inflammatory responses.</p> <p><b>Reproductive toxicity:</b></p>
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## Troy Proden PlaqueOff Powder for Cats

A *Fucus vesiculosus* extract exhibited estrogen effects in several in vitro studies. This extract (50 and 75  $\mu\text{mol/l}$ ) reduced 17- $\beta$ -estradiol levels in human granulosa cells and also competed with estradiol and progesterone for binding to their receptors. In another study, a *Fucus vesiculosus* (bladderwrack) extract competed for, and bound to, estrogen receptors ER $\alpha$  (IC<sub>50</sub> = 42.2  $\mu\text{mol/l}$ ), ER $\beta$  (IC<sub>50</sub> = 31.8  $\mu\text{mol/l}$ ), and PR-B (IC<sub>50</sub> = 31.8  $\mu\text{mol/l}$ ), with a slightly higher affinity for ER $\beta$ . In co-treatments with E2 (12.5 pM; EC<sub>50</sub>), a *Fucus vesiculosus* extract (2%) reduced the activation of the luciferase reporter by up to 50%, exhibiting potent ER antagonistic effects. ER-dependent and -independent cancer cell lines showed significantly decreased viability with increasing test material concentrations. The cell line-specific sensitivity suggests that *Fucus vesiculosus* extract was not toxic at up to 2%, but instead induces cell death through modulated pathways. In one study, aromatase activity following treatment of hLGCs with a *Fucus vesiculosus* extract (10 to 100  $\mu\text{mol/L}$ ) did not change. In vivo studies, a *Fucus vesiculosus* powder exhibited estrogenic effects. Daily oral administration (175 and 350 mg/kg/day) for 4 weeks resulted in a dose-dependent increase in the length of the estrous cycle and an overall 100% increase in the mean length of the dioestrus phase of the estrous cycle in the treated rats. Mean serum 17- $\beta$ -estradiol levels were reduced at 2 weeks and further reduced at 4 weeks. Female rats that had naturally high circulating estradiol had reduced serum 17- $\beta$ -estradiol (25% to 58% in all but 2 rats) after 1 week oral administration of a *Fucus vesiculosus* powder (350 mg/kg/day).

This powder (700 and 1400 mg/day) increased the menstrual cycle length and reduced the days of menstruation in a dose-dependent manner in three female human subjects with hypermenorrhea, dysmenorrhea, and other related ailments. In one subject, the plasma estradiol levels were decreased and the progesterone levels were increased in a dose-dependent manner.

**Irritation studies**

In an in vivo dermal irritation assay of an *Ascophyllum nodosum* extract (0.5 g in water) conducted in accordance with the OECD TG 404, a trade name mixture containing 4.7% *Ascophyllum Nodosum* Extract in 94.5% water was not considered to be an irritant. An *Ascophyllum nodosum* extract (0.5 g in water) administered to the shaved backs of rabbits under semi-occlusion for 4 h was not irritating. A skin cream containing a *Laminaria japonica* extract (10%; 20 mg) was not irritating to human subjects.

According to a specifications data sheet, a trade name mixture containing 4.7% *Ascophyllum Nodosum* Extract in 94.5% water was practically non-irritating when used in a Het-Cam test. An *Ascophyllum nodosum* extract (100 mg) administered to the eyes of rabbits had a maximum irritation score was 6.7 out of 8 at 1 h post-installation. The score decreased to 0 by day 7 and was rated as a mild ocular irritant. The ophthalmic irritation potential of an eye cream containing 0.076% *Sargassum Muticum* Extract was tested in 31 subjects. The test material did not indicate a potential for ophthalmologic irritation and was considered safe for use by both contact and non-contact lens wearers.

A gel with an aqueous *Fucus vesiculosus* extract (1%; 0.2 ml) was applied to one cheek of human subjects at least twice per day (morning and evening) for 5 weeks. There were no signs of erythema or edema during the experiment

**Sensitisation:**

HRIPs were performed using a night cream containing 0.05% *Alaria Esculenta* Extract, an eye cream containing 0.076% *Sargassum Muticum* Extract, and a skin care formulation containing 0.076% *Sargassum Muticum* Extract. No potential for dermal irritation or allergic contact sensitization was noted for any of the formulations.

**Phototoxicity:**

A phototoxicity study was performed according to OECD TG 432 using a trade name mixture containing 4.7% *Ascophyllum Nodosum* Extract in 94.5% water. No phototoxic activity was reported.

In an in vitro study examining the photo-protection potential involving a *Sargassum Muticum* extract, the effect of this extract against cell death induced by UVB radiation was studied. Cell viability was 61% in UVB (150 mJ/cm<sup>2</sup>) irradiated cells and 70% in UVB-irradiated cells treated with SME. Decreased numbers of apoptotic bodies as well as DNA fragmentation was apparent in cells exposed to SME and UVB versus UVB exposure alone.

**Notes:**

The ingredients in this safety assessment are derived from various species of brown algae. "Algae" is not a taxonomic group, but a functional group of convenience. Not all algae should be considered to be plant-like (seaweed; macroalgae). While some algae are seaweed, some are protozoa, and some are unique and belong in other kingdoms. However, these aquatic and oxygenic organisms are all part of the eclectic group called "algae."

There are several major groups of algae, and they are commonly referred to as brown algae (Phaeophyceae), green algae (Chlorophyta), diatoms (Bacillariophyceae), chrysophytes (Chrysophyta), blue-green algae (Cyanophyta), red algae (Rhodophyta), dinoflagellates (Pyrrhophyta), and euglenoids (Euglenophyta). The different algal phyla are differentiated by storage products, pigmentation, and cell wall composition.

**Cosmetic Ingredient Review Safety Assessment of Brown Algae-Derived Ingredients as Used in Cosmetics: January 2019**

[http://www.cir-safety.org/sites/default/files/browna122018TR\\_0.pdf](http://www.cir-safety.org/sites/default/files/browna122018TR_0.pdf)

Laxative properties of brown seaweeds (Phaeophyceae) have traditionally been attributed to the component alginic acid, a hydrophilic colloidal polysaccharide.

Kelp are frequently high in iodine content, and have been used traditionally for thyroid diseases. In humans, there are case reports of transient hyperthyroidism as a result of bladderwrack ingestion. Bladderwrack products contain up to 600  $\mu\text{g}$  per gram of iodine, while normal human iodine intake is approximately 100-200  $\mu\text{g}/\text{day}$ . Individuals ingesting bladderwrack or kelp products as food or supplements may ingest up to 30 times this amount. Chronic iodine toxicity may result in hypothyroidism, hyperthyroidism, goiter, or myxedema, although many individuals remain euthyroid. Systematic study of the effects of bladderwrack in humans is currently lacking, and there may be other active constituents. In terms of iodine content, a widely accepted standardization of iodine content in bladderwrack is lacking at this time, although some products may list iodine content on the label.

Theoretically, the thyroid stimulatory properties of bladderwrack may cause hypermetabolic weight loss. However, its anorectic properties have not been adequately evaluated in humans.

Doses of 700 to 1400 mg/day were found to increase the menstrual cycle lengths, decrease the days of menstruation per cycle, and decrease the serum levels of 17 $\beta$ -estradiol while was later carried out and showed similar effects.

Kelp products should not be used in cases of hyperthyroidism or cardiac problems, or during pregnancy and lactation. Excessive dosage (many times the recommended dosage) may lead to hyperthyroidism, tremor, increased pulse rate and elevated blood pressure.

Based on animal evidence, sodium alginate (soluble algae polysaccharide) may lower lipid levels in the blood. Because cholesterol is needed to produce sex hormones, it has been suggested that oral ingestion of kelp may affect circulating sex hormone levels and menstrual cycling patterns. Researchers tested the effects of bladderwrack to determine if its effects on women with or at high risk for estrogen-dependent diseases. Three pre-menopausal women with abnormal menstrual cycling patterns and/or menstrual-related disease histories received bladderwrack. Bladderwrack significantly increased menstrual cycle length by 5.5-14 days. In addition, hormone measurements in one woman revealed significant anti-estrogenic and progestagenic effects. Mean baseline 17 $\beta$ -estradiol levels were reduced from 626  $\pm$  91 to 164  $\pm$  30 pg/ml (p=0.04) following 700 mg daily, which decreased further to 92.5  $\pm$  3.5 pg/ml (p=0.03) with the 1.4 g daily dose. Mean baseline progesterone levels increased from 0.58  $\pm$  0.14 to 8.4  $\pm$  2.6 ng/ml with the 700 mg daily dose (p=0.1), which increased further to 16.8  $\pm$  0.7 ng/ml with the 1.4 g daily dose (p=0.002). The authors concluded that dietary bladderwrack may prolong the menstrual cycle and exert anti-oestrogenic effects in pre-menopausal women. The authors also suggested that seaweed may help reduce the risk of oestrogen-related cancers observed in Japanese populations. However, these preliminary findings need to be confirmed in well-controlled clinical trials.

For fucoidan: (a sulfated polysaccharide also known as galactofucan)

Fucoidan is reported to have a wide range of bioactive properties, such as anticancer, anti-inflammatory, anticoagulant and antiproliferative properties. The stimulatory effects of fucoidan depends on the species it is isolated from, molecular weight and position of and amount of the sulfate groups.

Because of the complex chemical structure of fucoidan, it cannot be fermented by gut microbiota. Still it has shown prebiotic-like effects and could increase the abundance of benign microbes in the gut, in a fashion similar to *Lactobacillus* spp. and short chain fatty acid (SCFA)-producers, whilst decreasing the number of opportunistic pathogens. These compositional changes in the gut could lead to indirect health promoting effects for the host and could potentially be used as a treatment of intestinal dysbiosis. Fucoidan degrading enzymes may be a way of identifying various immunostimulatory effects. Both fucoidanases, cutting the fucoidan backbone, and sulfatases may be valuable tools in addressing which structural elements are causing biological effects.

Fucoidan can stimulate the immune system by its ability to modify properties on the cell surface or act as an immunomodulator directly on macrophages, T-lymphocytes, B-cells, natural killer (NK) cells and induce production of interleukin 1 (IL-1) and interferon-gamma (INF-gamma), in



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vitro. Fucoidan also demonstrated to produce antitumor effects.

In several studies examining the role of fucoidan in the inflammatory processes associated with ischemia and collagen-induced arthritis in mice and in vitro macrophage cell lines, results indicated that low molecular weight fucoidan (LMWF) showed more potent bioactivity than high molecular weight fucoidan (HMWF). LMWF are usually isolated from algae or hydrolysed from HMWF. Both types of fucoidans showed an effect, but it was indicated that HMWF enhanced arthritis by increasing the activation of macrophages, while LMWF reduced arthritis through the suppression of specific cytokine-mediated immune reactions.

The anticoagulant properties of fucoidans from brown macroalgae have been studied. Results indicated that the structural differences not only determined anticoagulant potency, but also the mechanisms by which they carried out their activity. Fucoidan seemed to directly inhibit thrombin, and a single difference in one sulfate group per tetrasaccharide repeating unit altered the activity notably. In platelet aggregation assays, fucoidan with a high sulfate content (>20%) have shown greater anticoagulant activity in LMWF than fucoidan with a low sulfate content (<20%).

Several studies have been performed on the effect of fucoidan on cell migration and proliferation in vitro. In a migration assay of osteoblast cells fucoidan treated cells showed slightly decreased migration compared to the control cells. In addition, the cells shrunk and showed decreased spreading and adhesion. Fucoidan isolated from *Ascophyllum nodosum*, stimulated cell growth in the presence of fibroblast growth factor-1 whilst inhibiting proliferation induced by fibroblast growth factor-2. Similarly, in the presence of another sulfated polysaccharide (heparin), the cell migration was also inhibited.

Sulfated polysaccharides (SP) represent a complex group of biopolymers with a wide range of important biological functions and activities. Besides the sulfated glycosaminoglycans of vertebrates, SP are ubiquitous components of marine algae and marine invertebrates. While carrageenans and agarans, two types of sulfated galactans extracted from red algae species, have been industrially applied as hydrocolloids, fucoidans, the typical SP of brown algae of the class Phaeophyceae, are increasingly attracting attention as promising candidates for numerous health-supporting and therapeutic applications. Interest has mainly focused on their potentially beneficial effects in humans including antitumor, immunomodulatory, anti-inflammatory, antiviral, antithrombotic, anticoagulant, and antioxidant effects, as well as specific activities against kidney, liver and urinary system disorders.

Different studies were performed testing the toxic potential of fucoidan. No evidence of mutagenicity was reported when an Ames test was performed using a trade name mixture containing 7% hydrolyzed fucoidan extracted from *Laminaria digitata*. A dermal irritation assay was performed using the same trade name mixture containing 7% hydrolyzed fucoidan. The product was classified as a non-irritant.

No phototoxic potential was reported when Balb/c 3T3 cells were exposed to a mixture containing 7% hydrolyzed fucoidan extracted from *Laminaria digitata*. A neutral red uptake assay was performed on BALB/c 3T3 cells using a trade name mixture containing 7% hydrolyzed fucoidan extracted from *Laminaria digitata*. The product was reported to be not/mildly irritating.

**Anticancer activity:**

Intact fucoidans showed anticancer activity. Moreover, when hydrolyzed in boiling water with HCl for 5 min, the anticancer activity of fucoidans significantly increased. Results suggest that anticancer activity of fucoidans could be markedly improved when they are depolymerized in mild conditions.

Fucoidan isolated from the sporophyll of New Zealand *U. pinnatifida* exhibits similar cell growth-inhibition effects in breast adenocarcinoma cell line MCF-7, lung carcinoma cell line A-549, and colon adenocarcinoma cell line WiDr, in comparison with commercial fucoidan isolated from *F. vesiculosus*. Similar results are reported by another group where breast cancer cell line T-47D and melanoma cancer cell line SK-MEL-28 are susceptible to the anticancer effect of fucoidan isolated from *U. pinnatifida* grown in Japan Sea. There was an enhanced inhibitory effect against melanin biosynthesis in B16BL6 melanoma cells with low molecular weight fucoidan. It has also been shown that fucoidan from *U. pinnatifida* has antiproliferation effect on prostate and hepatocellular cancer cells. Research suggests that fucoidan treatment could induce intrinsic and extrinsic apoptosis pathways via the activation of extracellular signal-regulated kinase mitogen-activated protein kinase (ERK1/2 MAPK), the inactivation of p38 MAPK and phosphatidylinositol 3-kinase (PI3K)/Akt signaling pathways, and the downregulation of the Wnt/beta-catenin signaling pathway. Further research suggested that fucoidan induces apoptosis via a ROS-mediated mitochondrial pathway. By increasing reactive oxygen species (ROS) production, fucoidan induces mitochondrial oxidative damage, mitochondrial membrane potential (MMP) depolarization, and release of cytochrome c; combined with downregulation of Livin and XIAP mRNA and activation of caspase-3 and caspase-9. Another report demonstrates that fucoidan can ameliorate hepatic infrared injury in mice via JAK2/STAT1-mediated apoptosis and autophagy.

The anticancer activity of fucoidan is influenced by its sulfate content; low molecular weight fucans isolated from *Ascophyllum nodosum* exhibited increased antiproliferative activity on fibroblast cell line CCL39 with increased sulfate content. Likewise, oversulfated fucoidan from *F. vesiculosus* exhibited higher anti-angiogenesis potency on the growth of B16 melanoma cells, Lewis lung carcinoma, and Sarcoma 180 cell lines. This suggests that the sulfate content of fucoidan may be critical in influencing its anticancer activity.

**Antioxidant activity:**

The antioxidant capacity of fucoidan isolated from various seaweed species has been demonstrated in the literature. It has been reported that fucoidan typically exhibits strong secondary antioxidant activity that is comparable to synthetic antioxidants such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) that are known for causing side effects in humans including cancer. It has been reported that fucoidan isolated from *Sargassum binderi* exhibits significantly higher secondary antioxidant capacity, based on superoxide radical scavenging and hydrogen peroxide scavenging assays, than synthetic antioxidants BHA and BHT.

There have been numerous reports on the correlation between the antioxidant capacity of fucoidan and its sulfate content and molecular weight. Besides sulfate content, a correlation between molecular weight and the antioxidant capacity of fucoidan has also been reported. The high molecular weight fucoidan fractions show low inhibitory effects on low-density lipoprotein (LDL) oxidation while the low molecular weight fractions exhibited higher inhibitory effects.

**Anticoagulant effects:**

Studies have confirmed the anticoagulant and antithrombotic activity of fucoidan from the brown seaweeds *Saccharina latissimi*. The molecular weight of the fucoidan polymer is thought to be related to its anticoagulant activity. One study found that the fucoidan polymer exhibited the strongest anticoagulant activity with the molecular weight from approximately 10 kDa to 300 kDa. Fucoidans appeared to have no cytotoxic effect on the red blood cells, and the values of prothrombin time, activated partial thromboplastin time, and fibrinogen are significantly changed. The purified fucoidan significantly prolongs clotting time in a manner similar to heparin.

**Antibacterial activity:**

Antibacterial activity of fucoidan from *U. pinnatifida* has been tested and proven to be effective. Compared with Gram-negative strains, Gram-positive bacterial strains are more inhibited by fucoidan.

The antibacterial mechanism is due to a large amount of sulfuric acid and glucuronic acid in the depolymerization products of fucoidan, which have the property of polyanion. The depolymerized fucoidans bind to the bacterial membrane proteins and cause a membrane-disrupting effect that induces the expression of certain apoptotic factors, which leads to bacterial apoptosis.

**Other benefits:**

Fucoidin has significantly induced osteoblastic cell differentiation and has potential in use as a functional food ingredient in bone health supplement. Fucoidan from *C. okamuranus* (Phaeophyceae) protects gastric mucosa against acid and pepsin. Therefore, fucoidan can be developed as a potential antiulcer ingredient in functional foods.

**Note:**

It is generally challenging to produce marine SP in a reproducible quality, since they are not only usually complex, heterogeneous molecule mixtures, but they also vary substantially in their composition depending on the source material (e.g., alga species, harvest time), environmental parameters (e.g., light, nutrition, salinity, temperature), as well as the process of extraction and purification. Particularly, the fucoidans found in the cell walls and intercellular spaces of brown algae represent a tremendous number of structurally distinct fucose-containing SP ranging from homofucans to complex, highly branched heteropolysaccharides so that some authors consider the term fucose-containing sulfated polysaccharides more appropriate than the term fucoidan. Even crude fucoidan isolated from a single species of brown algae mostly consists of a mixture of structurally distinct polymers and the composition of this mixture may considerably vary depending on a multitude of factors. Aggravating this situation, the compounds indicated in literature as "fucoidans" considerably vary in their degree of purity, i.e., their content of co-extracted compounds like laminarin, alginic acid, proteins, polyphenols, etc. may influence the observed biological effect.

Acute Toxicity	✘	Carcinogenicity	✘
Skin Irritation/Corrosion	✘	Reproductivity	✘

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Serious Eye Damage/Irritation	✗	STOT - Single Exposure	✗
Respiratory or Skin sensitisation	✓	STOT - Repeated Exposure	✗
Mutagenicity	✗	Aspiration Hazard	✗

Legend: ✗ – Data either not available or does not fill the criteria for classification  
✓ – Data available to make classification

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

Troy Proden PlaqueOff Powder for Cats	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	Not Available	Not Available	Not Available	Not Available	Not Available

kelp extract (Ascophyllum nodosum)	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	Not Available	Not Available	Not Available	Not Available	Not Available

**Legend:** Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data

**DO NOT** discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
	No Data available for all ingredients	No Data available for all ingredients

Bioaccumulative potential

Ingredient	Bioaccumulation
	No Data available for all ingredients

Mobility in soil

Ingredient	Mobility
	No Data available for all ingredients

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

<b>Product / Packaging disposal</b>	<ul style="list-style-type: none"> <li>▶ Containers may still present a chemical hazard/ danger when empty.</li> <li>▶ Return to supplier for reuse/ recycling if possible.</li> </ul> <p>Otherwise:</p> <ul style="list-style-type: none"> <li>▶ If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.</li> <li>▶ Where possible retain label warnings and SDS and observe all notices pertaining to the product.</li> <li>▶ <b>DO NOT allow wash water from cleaning or process equipment to enter drains.</b></li> <li>▶ It may be necessary to collect all wash water for treatment before disposal.</li> <li>▶ In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.</li> <li>▶ Where in doubt contact the responsible authority.</li> </ul>
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SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (ADG): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

KELP EXTRACT (ASCOPHYLLUM NODOSUM) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Continued...

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Not Applicable

## National Inventory Status

National Inventory	Status
Australia - AICS	No (kelp extract (Ascophyllum nodosum))
Canada - DSL	No (kelp extract (Ascophyllum nodosum))
Canada - NDSL	No (kelp extract (Ascophyllum nodosum))
China - IECSC	No (kelp extract (Ascophyllum nodosum))
Europe - EINEC / ELINCS / NLP	No (kelp extract (Ascophyllum nodosum))
Japan - ENCS	No (kelp extract (Ascophyllum nodosum))
Korea - KECI	No (kelp extract (Ascophyllum nodosum))
New Zealand - NZIoC	No (kelp extract (Ascophyllum nodosum))
Philippines - PICCS	No (kelp extract (Ascophyllum nodosum))
USA - TSCA	No (kelp extract (Ascophyllum nodosum))
Taiwan - TCSI	No (kelp extract (Ascophyllum nodosum))
Mexico - INSQ	No (kelp extract (Ascophyllum nodosum))
Vietnam - NCI	No (kelp extract (Ascophyllum nodosum))
Russia - ARIPS	No (kelp extract (Ascophyllum nodosum))
<b>Legend:</b>	Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)

## SECTION 16 OTHER INFORMATION

<b>Revision Date</b>	12/05/2020
<b>Initial Date</b>	11/05/2020

## SDS Version Summary

Version	Issue Date	Sections Updated
2.1.1.1	11/05/2020	First Aid (swallowed)
3.1.1.1	12/05/2020	Fire Fighter (fire/explosion hazard), Ingredients

## Other information

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.

The 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.

## Definitions and abbreviations

PC—TWA: Permissible Concentration-Time Weighted Average  
 PC—STEL: Permissible Concentration-Short Term Exposure Limit  
 IARC: International Agency for Research on Cancer  
 ACGIH: American Conference of Governmental Industrial Hygienists  
 STEL: Short Term Exposure Limit  
 TEEL: Temporary Emergency Exposure Limit.  
 IDLH: Immediately Dangerous to Life or Health Concentrations  
 OSF: Odour Safety Factor  
 NOAEL :No Observed Adverse Effect Level  
 LOAEL: Lowest Observed Adverse Effect Level  
 TLV: Threshold Limit Value  
 LOD: Limit Of Detection  
 OTV: Odour Threshold Value  
 BCF: BioConcentration Factors  
 BEI: Biological Exposure Index

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