Equine Joint Support Formula 2

International Animal Health Products Pty Ltd

Chemwatch Hazard Alert Code: **2**

Chemwatch: **5370-58**
Version No: **5.1**
Safety Data Sheet according to WHS Regulations (Hazardous Chemicals) Amendment 2020 and ADG requirements

Issue Date: **23/12/2022**
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S.GHS.AUS.EN.E

SECTION 1 Identification of the substance / mixture and of the company / undertaking

Product Identifier

Product name	Equine Joint Support Formula 2
Chemical Name	Not Applicable
Synonyms	Not Available
Chemical formula	Not Applicable
Other means of identification	Not Available

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

Relevant identified uses	A natural supplement for joints where long-term use can assist in managing joint health and function.

Details of the manufacturer or supplier of the safety data sheet

Registered company name	**International Animal Health Products Pty Ltd**
Address	18 Healey Circuit Huntingwood NSW 2148 Australia
Telephone	+61 2 9672 7944
Fax	+61 2 9672 7988
Website	www.iahp.com.au
Email	info@iahp.com.au

Emergency telephone number

Association / Organisation	**Australian Poison Information Centre**
Emergency telephone numbers	**13 11 26 (24 Hours)**
Other emergency telephone numbers	**New Zealand: National Poisons Centre 0800 764 766 (24 hours)**

SECTION 2 Hazards identification

Classification of the substance or mixture

HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the WHS Regulations and the ADG Code.

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

Page 1 continued...

Label elements

Hazard pictogram(s)	
Signal word	**Danger**

Hazard statement(s)

H315	Causes skin irritation.
H318	Causes serious eye damage.

Supplementary statement(s)

Not Applicable

Precautionary statement(s) Prevention

P280	Wear protective gloves, protective clothing, eye protection and face protection.
P264	Wash all exposed external body areas thoroughly after handling.

Precautionary statement(s) Response

P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER/doctor/physician/first aider.
P302+P352	IF ON SKIN: Wash with plenty of water and soap.
P332+P313	If skin irritation occurs: Get medical advice/attention.
P362+P364	Take off contaminated clothing and wash it before reuse.

Precautionary statement(s) Storage

Not Applicable

Precautionary statement(s) Disposal

Not Applicable

SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
3416-24-8	10-30	D-glucosamine
9056-36-4	1-10	chondroitin sulfate, sodium salt
471-34-1	1-10	calcium carbonate
Not Available	balance	Ingredients determined not to be hazardous

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI; 4. Classification drawn from C&L; * EU IOELVs available*

SECTION 4 First aid measures

Description of first aid measures

Eye Contact	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. ▸ Seek medical attention without delay; if pain persists or recurs seek medical attention. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin or hair contact occurs:

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	▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If dust is inhaled, remove from contaminated area. ▸ Encourage patient to blow nose to ensure clear passage of breathing. ▸ If irritation or discomfort persists seek medical attention.
Ingestion	▸ Immediately give a glass of water. ▸ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5 Firefighting measures

Extinguishing media

- There is no restriction on the type of extinguisher which may be used.
- Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	▸ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves in the event of a fire. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding 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.
Fire/Explosion Hazard	▸ 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. ▸ 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). ▸ 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. ▸ 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). ▸ 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. ▸ 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. ▸ 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. ▸ 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. ▸ All movable parts coming in contact with this material should have a speed of less than 1-meter/sec. ▸ 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. ▸ 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).

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	▸ 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. Combustion products include: carbon monoxide (CO) carbon dioxide (CO2) nitrogen oxides (NOx) metal oxides other pyrolysis products typical of burning organic material.
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	▸ Clean up all 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. ▸ Sweep up, shovel up or ▸ Vacuum up (consider explosion-proof machines designed to be grounded during storage and use). ▸ Place spilled material in clean, dry, sealable, labelled container.
Major Spills	Moderate hazard. ▸ **CAUTION**: Advise personnel in area. ▸ Alert Emergency Services 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.

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

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling	Sweep up. ▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ When handling **DO NOT** eat, drink or smoke. ▸ Always wash hands with soap and water after handling. ▸ Avoid physical damage to containers. ▸ Use good occupational work practice. ▸ Observe manufacturer's storage and handling recommendations contained within this SDS.
Other information	▸ Keep dry. ▸ Store under cover. ▸ Store in a well ventilated area. ▸ Store away from sources of heat or ignition. ▸ Observe manufacturer's storage and handling recommendations contained within this SDS.

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

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SECTION 8 Exposure controls / personal protection

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Australia Exposure Standards	calcium carbonate	Calcium carbonate	10 mg/m3	Not Available	Not Available	(a) This value is for inhalable dust containing no asbestos and < 1% crystalline silica.

Emergency Limits

Ingredient	TEEL-1	TEEL-2	TEEL-3
calcium carbonate	45 mg/m3	210 mg/m3	1,300 mg/m3

Ingredient	Original IDLH	Revised IDLH
D-glucosamine	Not Available	Not Available
chondroitin sulfate, sodium salt	Not Available	Not Available
calcium carbonate	Not Available	Not Available

Exposure controls

Appropriate engineering controls	None required when handling small quantities. **OTHERWISE:** General exhaust is adequate under normal operating conditions.
Individual protection measures, such as personal protective equipment	
Eye and face protection	No special equipment for minor exposure i.e. when handling small quantities. OTHERWISE: ▸ Safety glasses with side shields. ▸ 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]
Skin protection	See Hand protection below
Hands/feet protection	No special equipment needed when handling small quantities. **OTHERWISE**: Wear chemical protective gloves, e.g. PVC.
Body protection	See Other protection below
Other protection	No special equipment needed when handling small quantities. **OTHERWISE:** ▸ Overalls. ▸ Barrier cream. ▸ Eyewash unit.

Respiratory protection

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

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required. Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	A-AUS P2	-	A-PAPR-AUS / Class 1 P2
up to 50 x ES	-	A-AUS / Class 1 P2	-
up to 100 x ES	-	A-2 P2	A-PAPR-2 P2 ^

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^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), 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.
· Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU)
· 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

Appearance	Brick red free flowing powder; insoluble in water.

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

SECTION 10 Stability and reactivity

Reactivity	See section 7
Chemical stability	▸ Unstable in the presence of incompatible materials. ▸ Product is considered stable. ▸ Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 Toxicological information

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Information on toxicological effects

Inhaled	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. 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. If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result in excessive exposures.
Ingestion	The material has **NOT** 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.
Skin Contact	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.
Eye	This material can cause eye irritation and damage in some persons.
Chronic	Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure. 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.

Equine Joint Support Formula 2	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
D-glucosamine	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
chondroitin sulfate, sodium salt	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
calcium carbonate	**TOXICITY**	**IRRITATION**
	dermal (rat) LD50: >2000 mg/kg[1]	Eye (rabbit): 0.75 mg/24h - SEVERE
	Inhalation(Rat) LC50: >3 mg/l4h[1]	Eye: no adverse effect observed (not irritating)[1]
	Oral (Rat) LD50: >2000 mg/kg[1]	Skin (rabbit): 500 mg/24h-moderate
		Skin: no adverse effect observed (not irritating)[1]
Legend:	*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*	

D-GLUCOSAMINE	Based on laboratory and animal testing, exposure to the material may result in irreversible effects and mutations in humans. For glucosamines: Most studies involving humans have found that short-term use of glucosamine is well-tolerated. Side effects may include drowsiness, headache, insomnia, and mild and temporary digestive complaints such as abdominal pain, poor appetite, nausea, heartburn, constipation, diarrhea, and vomiting. In rare human cases, the combination of glucosamine and chondroitin has been linked with temporarily elevated blood pressure and heart rate and palpitations. There is some preliminary evidence suggesting that glucosamine, in doses used to treat osteoarthritis, may alter levels of blood sugar, insulin and/or haemoglobin A1C (a test that measures how well blood sugar has been controlled during the previous three months) in people with diabetes or insulin resistance. Another concern has been that the extra glucosamine could contribute to diabetes by interfering with the normal regulation of the hexosamine biosynthesis pathway but several investigations have found no evidence that this occurs Glucosamine sulfate may increase the risk of developing insulin resistance and could decrease the metabolic actions of insulin. Although glucosamine and chondroitin sulfate are biochemically classed as carbohydrates (sugars), the body is not able to break them down into glucose, so these compounds do not raise blood sugar by providing an additional source of glucose. Glucosamine does not cause glucose intolerance and has no documented effects on glucose metabolism. High dosages of glucosamine may cause gastric problems, nausea , diarrhea, indigestion, and heartburn. **Special Precautions and warnings:** Pregnancy or breast-feeding: There is nott enough reliable information to know if glucosamine sulfate, glucosamine hydrochloride, or N-acetyl glucosamine is safe to use when pregnant or breast-feeding. Asthma: There is one report linking an asthma attack with taking glucosamine. It is not known for sure if glucosamine was the cause of the asthma attack. Diabetes: Some early research suggested that glucosamine might raise blood sugar in people with diabetes. But more recent and more reliable research now shows that glucosamine does not seem to affect blood sugar control in people with type 2 diabetes. Glucosamine appears to be safe for most people with diabetes, but blood sugar should be monitored closely. Glaucoma: Glucosamine might increase the pressure inside the eye and could worsen glaucoma.

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High cholesterol: Some early research suggested that glucosamine may increase cholesterol levels. But more recent and reliable research now shows that glucosamine does not seem to increase cholesterol levels.
High blood pressure: Some early research suggested that glucosamine may increase insulin levels. But more recent and reliable research shows that glucosamine does not increase blood pressure..
Shellfish allergy: There is some concern that glucosamine products might cause allergic reactions in people who are sensitive to shellfish. Glucosamine is produced from the shells of shrimp, lobster, and crabs. Allergic reactions in people with shellfish allergy are caused by the meat of shellfish, not the shell. But some people have developed an allergic reaction after using glucosamine supplements. It is possible that some glucosamine products might be contaminated with the part of the shellfish meat that can cause an allergic reaction.

O-GlcNAcylation

O-GlcNAcylation is the process of adding a single N-acetylglucosamine sugar to the serine or threonine of a protein. Comparable to phosphorylation, addition or removal of N-acetylglucosamine is a means of activating or deactivating enzymes or transcription factors In fact, O-GlcNAcylation and phosphorylation often compete for the same serine/threonine sites. O-GlcNAcylation most often occurs on chromatin proteins, and is often seen as a response to stress.
Hyperglycemia increases O-GlcNAcylation, leading to insulin resistance. Increased O-GlcNAcylation due to hyperglycemia is evidently a dysfunctional form of O-GlcNAcylation. O-GlcNAcylation decline in the brain with age is associated with cognitive decline. When O-GlcNAcylation was increased in the hippocampus of aged mice, spatial learning and memory improved. The mean percent depletion of cysteine and lysine was 1%, interpreted as minimal reactivity in the assay, and yielding a prediction of no sensitization.

Safety profiles (Safety Assessment of Glucosamine Ingredients as Used in Cosmetics:.Cosmetic Ingredient Review (CIR): September 13-14, 2021)
The safety of acetyl glucosamine, glucosamine, glucosamine HCl, and glucosamine sulfate as used in cosmetics has been reviewed. Acetyl glucosamine and glucosamine sulfate are reported to function in cosmetics as skin-conditioning agents and glucosamine HCl is reported to function as a pH adjuster.
The Norwegian Food Safety Authority calculated Margin of Safety (MoS) values for the use of 10% Glucosamine Sulfate in a body lotion, leg cream, face cream, and from overall exposure from cosmetics. The MoS for each of these formulation types were 35.0, 99.0, 178.0, and 29.2, respectively

Skin penetration

The penetration ability of acetyl glucosamine was evaluated in split-thickness Caucasian cadaver skin. Approximately 7% of the applied test substance (which contained 2% acetyl glucosamine) permeated the skin after 6 h. An in vitro permeation assay was also performed with glucosamine HCl in human epidermal membranes. Over a 48-h period, glucosamine HCl permeated through the skin with a flux of 1.497 ± 0.42 µg/cm2/h, a permeability coefficient of 5.66 ± 1.6 x 10-6 cm/h, and a lag time of 10.9 ± 4.6 h. In a different study, the skin permeation rate of glucosamine sulfate was determined to be 13.27 ug/cm2/h when evaluated in Sprague-Dawley full-thickness rat skin.Female Beagle dogs were given a single dose of 450 mg glucosamine HCl, and a pharmacokinetic analysis was performed. Glucosamine was detected in the blood up to 8 h post-dose, with a Tmax of 2 h and a Cmax of 9.69 ug/ml. [14C] Glucosamine HCl diluted with unlabeled glucosamine sulfate was given to Sprague-Dawley rats to examine excretion patterns of radioactivity. Radioactivity analysis in tissues and organs revealed that [14C] glucosamine quickly entered into all tissues, included cartilage, reaching a maximum at 8 h.
Bioavailability was also evaluated in humans. Healthy, Chinese, adult males, under fasting conditions, were given a single oral dose of 480 mg glucosamine HCl in a dispersible tablet or capsule form. The mean Cmax, Tmax, and T1/2 values were reported to be 907.1 ng/ml, 3.03 h, and 1.10 h, respectively, for the dispersible tablet form, and 944.40 ng/ml, 3.30 h, and 1.50 h, respectively, for the capsule form. The pharmacokinetics of glucosamine after a single oral administration of glucosamine sulfate and glucosamine HCl were evaluated in 12 healthy volunteers. Glucosamine was determined at steady state in plasma collected up to 48 h after the last dose by a validated LC-MS/MS method. After glucosamine sulfate administration, peak concentrations and extent of exposure averaged 9.1 ± 6.3 uM and 76.5 ± 23.0 uM/h, respectively. Significantly lower plasma concentrations (p= 0.005) were determined after the administration of glucosamine HCl.

Acute toxicity:

The lowest reported oral LD50s for glucosamine were reported to be >5000 mg/kg in mice, and >8000 mg/kg in rats and rabbits. In a 9-wk study, glucosamine (0.5%) was fed to male Sprague-Dawley and Spontaneously Hypertensive rats (SHR) rats. The systolic blood pressure in treated rats was statistically significantly lower than control animals. No statistically significant histological differences were found in the hearts, kidneys, and livers, among the treated and control groups. Acetyl glucosamine (up to 5%) was fed to F344 rats for 13 weeks. No obvious indications of toxicity were observed in any of the parameters evaluated. The NOAEL was determined to be > 5%. The effect of orally-ingested acetyl glucosamine (1000 mg) was evaluated in healthy Japanese adults. Volunteers ingested the dissolved acetyl glucosamine in water, once a day, for 16 weeks. A control group received green tea extract powder. Routine physical and cardiovascular characteristics, hematology, and blood chemistry, did not show any significant abnormalities between control and treated groups. The potential toxic effects of a tablet containing glucosamine HCl (1500 mg/d), chondroitin sulfate (1200 mg/d), and manganese ascorbate (228 mg/d) in degenerative disease patients was evaluated in a 16-week crossover study. No patients reported symptoms requiring termination of study,and symptom frequency on medication was similar to that at baseline. Vital signs, occult blood testing, and hematologic parameters were similar among the placebo and medicated groups. The chronic toxicity potential of acetyl glucosamine (up to 5%) given in the diet for 52 weeks was evaluated in F344 rats. No toxic effects were observed in any parameter evaluated, however, slight suppression of body weight gain was observed in animals dosed with concentrations of greater than 2.5%.

Reproductive toxicity

The effects of glucosamine (20 mg) treatment via oral ingestion and peritoneal injection was evaluated in 8-week old and 16-week old adult female C57B1/6 mice. Mice were fed the test substance via diet for 3 week, and injected with glucosamine for 3 consecutive days. On the third day of injection, mice were mated. Pregnancy outcomes were assessed at day 18 of gestation. Fetal weight and length were reduced in glucosamine-treated 16-wk old mice, compared to control animals. In addition, a significantly higher number of abnormal fetuses was present in litters of 16-wk old glucosamine-treated mice compared with all other groups ($p < 0.05$). The effects of premating glucosamine supplementation via drinking water on Sprague-Dawley rat litter homogeneity, uterine receptivity, and maternal hormones levels were evaluated. Female rats were given 0.5 mM Glucosamine via drinking water for 2 wk, and then mated. Birth weights and absolute and relative ovary weights were statistically significantly greater in the glucosamine-treated group compared to the control group ($P < 0.05$). Maternal progesterone, estradiol, and insulin-

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like growth factor 1 (IGF-1) concentrations on day 19.5 of pregnancy were significantly increased in treated rats, while insulin and total cholesterol levels were significantly decreased compared with control rats. The effects of intrauterine glucosamine (up to 1500 µg) were evaluated in female ICR mice. Ten days after implantation of the glucosamine pellet, mice were mated. Mice that received glucosamine pellets delivered significantly fewer live pups/litter over a 60-d pellet active period than those that received placebo pellets. However, after the 60-day pellet active period, there was no statistically significant difference in litter sizes delivered by glucosamine-treated and placebo-treated mice, except at the highest dose level.

Genotoxicity:

Acetyl glucosamine (up to 5000 µg/plate) was considered to be non-mutagenic in an Ames assay using S. typhimurium strains TA 1537, TA 1535, TA 98, TA 100, and TA 102, with and without metabolic activation. Similarly, an Ames assay was performed on glucosamine HCl derived from Aspergillus niger. Tester strains (S. typhimurium and E. coli WP2 uvrA) were exposed to up to 5000 ug/plate of the test substance, with and without metabolic activation. No mutagenicity was observed. In an in vivo micronucleus assay, mice (strain not reported) were administered Aspergillus niger-derived glucosamine HCl (up to 2000 mg/kg bw) in water, via gavage. There was no statistically significant decrease in the ratios of polychromatic erythrocytes (PCE) and normochromatic erythrocytes (NCE) at any dose level.

In an in vitro anti-genotoxicity assay, human peripheral lymphocytes were exposed to glucosamine or acetyl glucosamine at concentrations up to 50 mM. DNA damage was induced with hydrogen peroxide. Glucosamine, at all concentrations, showed a significant protective activity ($P < 0.001$) against hydrogen peroxide-induced DNA damage. Acetyl glucosamine only indicated a slight DNA protection at the highest test concentration. The chemoprotective ability of glucosamine (diets containing up to 150 mg/kg glucosamine; 7 day exposure) against cisplatin-induced genotoxicity was evaluated in male Wistar rats. The test substance was considered to be an effective chemoprotector against cisplatin-induced DNA damage.

Carcinogenicity:

The carcinogenic potential of acetyl glucosamine (up to 5% in the diet; 104-week treatment) was evaluated in F344 rats. The test substance was considered to be non-carcinogenic. The anti-proliferative potential of glucosamine (10 mM) was evaluated in human renal cancer cell lines (786-O and caki-1) via an 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) and fluorescein isothiocyanate (FITC)-annexin V/PI assay. The apoptosis rate of both cell lines was up-regulated by the high concentration of glucosamine (10 mM), but down-regulated by low concentrations of glucosamine (1 and 5 mM), as compared with the control groups.

The growth inhibitory effects of glucosamine, glucosamine HCl, and acetyl glucosamine on human haematoma SMMC-721 cells was evaluated in vitro. Tumor cells were exposed to glucosamine, glucosamine HCl, or acetyl glucosamine, at concentrations of up to 1000 ug/ml. Results measured by an MTT assay showed that glucosamine HCl and glucosamine caused a concentration-dependent reduction in hepatoma cell growth.

In an in-vivo anti-carcinogenicity assay, Kunming male mice were inoculated with sarcoma 180 tumor cells. Mice were orally treated with up to 500 mg/kg glucosamine HCl dissolved in saline for 10 d. Glucosamine HCl, at the intermediate dose (250 mg/kg/d), had the highest inhibition ratio (34.02%) on sarcoma 180 tumor growth.

Melanin effects:

The effect of acetyl glucosamine on melanin production was evaluated in an in vitro assay. Reconstituted human tanned epidermis cells were exposed to up to 5% acetyl glucosamine in water for 10 days. Dose-dependent decreases in melanin content were observed.

The whitening effect of acetyl glucosamine (5%) was evaluated in human and brown guinea pig skin subjected to UV-induced pigmentation. A visual reduction in hyperpigmentation was observed 2 week after treatment with the acetyl glucosamine solution, in humans, compared to the vehicle-treated group .Acetyl glucosamine-treated guinea pig skin had decreased levels of melanin without affecting the number of melanocytes, compared to vehicle-treated skin.

The reduction of facial hyperpigmentation after topical treatment on acetyl glucosamine was evaluated in a 10-week trial. Volunteers (101 women/group) were instructed to apply a facial lotion containing 4% niacinamide and 2% acetyl glucosamine twice a day for 8 weeks. A control group applied the lotion vehicle without 4% and 2% acetyl glucosamine. By all parameters measured, the niacinamide and acetyl glucosamine formulation regimen caused a significant reduction in the detectable area of facial spots and appearance of pigmentation compared to the controls ($P < 0.05$). In a similar study, healthy Japanese women ($n = 25$ women/group) were instructed to apply a facial lotion containing 2% acetyl glucosamine on the side of the face, twice daily, for 8 weeks. A control group applied the vehicle lotion that did not contain acetyl glucosamine. Topical 2% acetyl glucosamine reduced the appearance of facial hyperpigmentation, with an overall directional ($p = 0.089$) spot area fraction change across the entire study.The effects of a neck cream formulation containing 8% acetyl glucosamine was evaluated in 45 Caucasian women. Applications of the cream occurred once a day, for 16 week. The test cream was well-tolerated with no signs of irritation. One subject experienced an adverse event of contact dermatitis on two separate occasions. No other adverse events were reported.

Allergenicity:

The effect of glucosamine injections (concentrations up to 1 mg/2.5 µl) on ovalbumin (OVA)-induced atopic dermatitis was evaluated in female BALB/c mice. Clinical dermatitis scores decreased with increasing glucosamine dose ($P < 0.001$). Concentrations of tissue IL-13 and IL-17 decreased after glucosamine administration (each group: $P = 0.002$ and $P < 0.001$, respectively), but the concentrations of tissue IL-4 did not show differences across groups. The anti-allergic effect of glucosamine (concentrations up to 5%) in female BALB/c mice with allergic rhinitis was evaluated. OVA-specific IgE and eosinophils in bronchoalveolar lavage (BAL) fluid were significantly decreased after 5% oral glucosamine treatment compared with the positive control group. In addition, significant improvement of inflammation was apparent in groups treated with glucosamine when compared to the positive control group.

The anti-allergic effects of orally-ingested acetyl glucosamine and glucosamine HCl (up to 1 mg/mouse; 6 day treatment) was also evaluated in BALB/c mice with dinitrofluorobenzene (DNFB)-induced skin sensitization. Oral administration of acetyl glucosamine or glucosamine HCl significantly inhibited DNFB-induced ear swelling in mice at both 6 hours and 24 hours after DNFB challenge ($P < 0.05$), and reduced the concentration of histamine in both the ear and plasma of DNFB-treated mice ($P < 0.05$).

The tolerability of orally-ingested, shrimp-derived glucosamine was evaluated in 15 shrimp-allergic individuals. Subjects were given either 1500 mg of synthetically-derived or shrimp-derived glucosamine. All subjects tolerated the 1500 mg glucosamine administration from the shrimp-derived and synthetic sources, without any incidences of hypersensitivity.

The effect of orally-administered glucosamine (25 mg/kg) in the treatment of atopic dermatitis was evaluated in an 8-week placebo-controlled, double-blind, clinical trial. Among the 16 patients receiving glucosamine treatment, 15 patients reported

Continued...

	clinical improvement of atopic dermatitis symptoms. Three glucosamine-treated patients reported adverse effects, with abdominal pain being the most common adverse effect. **Dermal toxicity:** Potential skin irritation of acetyl glucosamine was evaluated in an in vitro assay using 3 reconstructed human epidermis samples. Reduction of cell viability was similar in the negative control and treated groups, therefore, the substance was considered to be non-irritating. A Direct Peptide Reactivity Assay (DPRA) was performed according to OECD TG 442C in order to evaluate the sensitization. This assay is designed to mimic the covalent binding of electrophilic chemicals to nucleophilic centers in skin proteins by quantifying the reactivity of chemicals towards the model synthetic peptides containing cysteine and lysine. The mean percent depletion of cysteine and lysine was 1%, interpreted as minimal reactivity in the assay, and yielding a prediction of no sensitization **Ocular toxicity:** An in vitro ocular irritation assay was performed in bovine corneas using a saline solution containing 20% acetyl glucosamine. The mean in vitro irritancy scores for the test substance, negative control (saline), and positive control (20% imidazole in saline) were 0.42, 0.70, and 105.42, respectively. **Case Reports** A 52-year old complained of exacerbation of underlying asthma after beginning treatment with a glucosamine-chondroitin sulfate preparation containing 500 mg glucosamine. Within 24 h of discontinuing glucosamine and chondroitin treatment, the patient s asthma symptoms completely resolved. A 67-year-old male was referred to a nephrology consultant due to non-proteinuric renal insufficiency and a reduction in GFR supposedly due to glucosamine intake for the past 3 years. After stopping glucosamine for 3 week, GFR increased from 47.5 to 60 ml/min. A 76-year-old woman with arterial hypertension and osteoarthritis was referred for evaluation after an episode of urticaria after glucosamine sulfate intake. After treatment with antihistamines and corticosteroids, symptoms resolved within 4 hours. The association between glucosamine use and colorectal cancer risk was examined among 113,067 volunteers. Participants were asked to log their glucosamine intake from 2001 - 2011. Current use of glucosamine, modeled using a time-varying exposure, was associate with a lower risk of colon cancer (HR: 0.83, 95% CI: 0.71 - 0.97), compared to those who reported no ingestion of glucosamine. Similarly, the association between lung cancer and glucosamine was evaluated in 76,904 volunteers with no prior history of lung cancer. The participants were queried on their use of glucosamine from the years 2000 - 2010. Compared to non-use, use of glucosamine was associated with a 20% reduction in lung cancer risk (HR: 0.80, 95% CI: 0.65 - 0.99) after multivariable adjustment For HIF ((hypoxia-inducible factor) inhibitors Considering that endothelial HIF-1alpha was shown to be critical for left heart adaptation to overload, systemically targeting HIFs might have unintended consequences for ventricular adaptation in pulmonary hypertension (PH). HIF-2 inhibition appeared to improve right ventricular haemodynamics over a short period, but a detailed functional analysis at later time points would be prudent. Under normoxic conditions, HIF-1alpha and HIF-2alpha are hydroxylated by PHD (prolyl hydroxylase domain) proteins (particularly PHD2), ubiquitinated, and rapidly degraded. PHD activity becomes rate limited during hypoxia, allowing accumulation of HIF-1alpha/2alpha and induction of HIF activity. Additionally, the observation that mice with loss of PHD2 developed severe PH should raise a cautionary flag regarding the clinical use of PHD inhibitors, which are currently in development for chronic anemia. Early clinical trials did not report any major side effects, but assessments were made based on short-term use. Serious pulmonary side effects could be possible with chronic use of PHD inhibitors.
CALCIUM CARBONATE	No evidence of carcinogenic properties. No evidence of mutagenic or teratogenic effects. Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. On the other hand, industrial bronchitis is a disorder that occurs as a result of exposure due to high concentrations of irritating substance (often particles) and is completely reversible after exposure ceases. The disorder is characterized by difficulty breathing, cough and mucus production. The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis. The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
D-GLUCOSAMINE & CHONDROITIN SULFATE, SODIUM SALT	No significant acute toxicological data identified in literature search.

Acute Toxicity	✗	**Carcinogenicity**	✗
Skin Irritation/Corrosion	✓	**Reproductivity**	✗
Serious Eye Damage/Irritation	✓	**STOT - Single Exposure**	✗
Respiratory or Skin sensitisation	✗	**STOT - Repeated Exposure**	✗
	✗		✗

Continued...

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

Equine Joint Support Formula 2	**Endpoint**	**Test Duration (hr)**	**Species**	**Value**	**Source**
	Not Available	Not Available	Not Available	Not Available	Not Available
D-glucosamine	**Endpoint**	**Test Duration (hr)**	**Species**	**Value**	**Source**
	Not Available	Not Available	Not Available	Not Available	Not Available
chondroitin sulfate, sodium salt	**Endpoint**	**Test Duration (hr)**	**Species**	**Value**	**Source**
	Not Available	Not Available	Not Available	Not Available	Not Available
calcium carbonate	**Endpoint**	**Test Duration (hr)**	**Species**	**Value**	**Source**
	EC50	72h	Algae or other aquatic plants	>14mg/l	2
	NOEC(ECx)	1h	Fish	4-320mg/l	4
	LC50	96h	Fish	>165200mg/L	4
Legend:	*Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 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
D-glucosamine	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
D-glucosamine	LOW (LogKOW = -2.1962)

Mobility in soil

Ingredient	Mobility
D-glucosamine	LOW (KOC = 10)

SECTION 13 Disposal considerations

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible or consult manufacturer for recycling options. ▸ Consult State Land Waste Management Authority for disposal. ▸ Bury residue in an authorised landfill. ▸ Recycle containers if possible, or dispose of in an authorised landfill.

SECTION 14 Transport information

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Continued...

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

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

Not Applicable

14.7.2. Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

Product name	Group
D-glucosamine	Not Available
chondroitin sulfate, sodium salt	Not Available
calcium carbonate	Not Available

14.7.3. Transport in bulk in accordance with the IGC Code

Product name	Ship Type
D-glucosamine	Not Available
chondroitin sulfate, sodium salt	Not Available
calcium carbonate	Not Available

SECTION 15 Regulatory information

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

D-glucosamine is found on the following regulatory lists

Australian Inventory of Industrial Chemicals (AIIC)

chondroitin sulfate, sodium salt is found on the following regulatory lists

Not Applicable

calcium carbonate is found on the following regulatory lists

Australian Inventory of Industrial Chemicals (AIIC)

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

National Inventory Status

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	No (chondroitin sulfate, sodium salt)
Canada - DSL	No (chondroitin sulfate, sodium salt)
Canada - NDSL	No (D-glucosamine; chondroitin sulfate, sodium salt)
China - IECSC	No (chondroitin sulfate, sodium salt)
Europe - EINEC / ELINCS / NLP	No (chondroitin sulfate, sodium salt)
Japan - ENCS	No (chondroitin sulfate, sodium salt)
Korea - KECI	No (D-glucosamine; chondroitin sulfate, sodium salt)
New Zealand - NZIoC	Yes
Philippines - PICCS	No (D-glucosamine; chondroitin sulfate, sodium salt)
USA - TSCA	No (chondroitin sulfate, sodium salt)
Taiwan - TCSI	No (chondroitin sulfate, sodium salt)
Mexico - INSQ	No (D-glucosamine; chondroitin sulfate, sodium salt)
Vietnam - NCI	No (chondroitin sulfate, sodium salt)
Russia - FBEPH	No (D-glucosamine; chondroitin sulfate, sodium salt)
National Inventory	**Status**
Legend:	*Yes = All CAS declared ingredients are on the inventory* *No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.*

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SECTION 16 Other information

Revision Date	23/12/2022
Initial Date	19/09/2019

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
ES: Exposure Standard
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
AIIC: Australian Inventory of Industrial Chemicals
DSL: Domestic Substances List
NDSL: Non-Domestic Substances List
IECSC: Inventory of Existing Chemical Substance in China
EINECS: European INventory of Existing Commercial chemical Substances
ELINCS: European List of Notified Chemical Substances
NLP: No-Longer Polymers
ENCS: Existing and New Chemical Substances Inventory
KECI: Korea Existing Chemicals Inventory
NZIoC: New Zealand Inventory of Chemicals
PICCS: Philippine Inventory of Chemicals and Chemical Substances
TSCA: Toxic Substances Control Act
TCSI: Taiwan Chemical Substance Inventory
INSQ: Inventario Nacional de Sustancias Químicas
NCI: National Chemical Inventory
FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances