SAFETY DATA SHEET
(in accordance with Regulation (EU) 2020/878)

0400PO-ctx400 ClorProtect

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING.

1.1 Product identifier.

Product Name:	ctx400 ClorProtect
Product Code:	0400PO
Chemical Name:	cyanuric acid
CAS No:	108-80-5
Registration No:	01-2119480421-45-XXXX

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

Chlorine stabilizer

Uses advised against:
Uses other than those recommended.

1.3 Details of the supplier of the safety data sheet.

Company:	**FLUIDRA COMERCIAL ESPAÑA, S.A.U.**
Address:	Av. Alcalde Barnils, 69
City:	08174 Sant Cugat del Vallès
Province:	Barcelona (España)
Telephone:	telf: 902 42 32 22
Fax:	+34 93 713 41 11
E-mail:	fds@inquide.com
Web:	www.ctxprofessional.com

1.4 Emergency telephone number: +34 93 724 39 00 (Only available during office hours; Monday-Friday; 08:00-18:00)
Anti poisoning centre:
ITALY (Rome): 06/305 43 43
ITALY (Milan): 02/66 10 10 29
SPAIN: +34 91 562 04 20
FRANCE (Paris): 01 40 05 48 48 FRANCE (Tolousse): 05 61 77 74 47 FRANCE (Marseille): 04 91 75 25 25
PORTUGAL: 808 250 143
BELGIQUE (Brussel): (+32) 070 245 245
Sweden: 112 - Begär Giftinformation (ask for Poisons Information)
Denmark (Giftlinjen): +45 8212 1212
Finland: 0800 147 111
Norway: +47 22 59 13 00
Cyprus: 1401
Greece: (0030) 2107793777
Netherlands (NVIC): +31 (0)88 755 8000
Romania: +4021 318 360 6 Biroul RSI Si Informare Toxicologica
Apelabil de luni pâna vineri, între orele 8.00-15.00
CAV accreditati: Roma +39 06 68 59 3726; Foggia +39 800 18 34 59; Napoli +39 081 54 53 333; Roma +39 06 49 97 80 00; Roma +39 06 30 54 343; Firenze +39 055 79 47 819; Pavia +39 0382 24 444; Milano +39 02 66 10 10 29; Bergamo +39 800 88 33 00; Verona +39 800 01 18 58.

SECTION 2: HAZARDS IDENTIFICATION.

2.1 Classification of the substance or mixture.
The product is not classified as hazardous within the meaning of Regulation (EU) No 1272/2008.

2.2 Label elements.
Precautionary statements:

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P101 If medical advice is needed, have product container or label at hand.
P102 Keep out of reach of children.
P103 Read carefully and follow all instructions.

Contains:
cyanuric acid

2.3 Other hazards.

The substance is not PBT
The substance is not vPvB
Substance does not have endocrine disrupting properties.

In normal use conditions and in its original form, the product itself does not involve any other risk for health and the environment.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS.

3.1 Substances.

Identifiers	Name	Concentrate	(*)Classification - Regulation (EC) No 1272/2008	
			Classification	Specifics concentration limits and Acute toxicity estimate
CAS No: 108-80-5	cyanuric acid	80 - 100 %	-	-

3.2 Mixtures.
Not Applicable.

SECTION 4: FIRST AID MEASURES.

4.1 Description of first aid measures.
Due to the composition and type of the substances present in the product, no particular warnings are necessary.

Inhalation.
If breathing stops, give artificial respiration and seek immediate medical attention. Take the victim into open air; keep them warm and calm. If breathing is irregular or stops, perform artificial respiration.

Eye contact.
Remove contact lenses, if present and if it is easy to do. Wash eyes with plenty of clean and cool water for at least 10 minutes while pulling eyelids up, and seek medical assistance. Dont let the person to rub the affected eye.

Skin contact.
Remove contaminated clothing.

Ingestion.
Keep calm. NEVER induce vomiting.

4.2 Most important symptoms and effects, both acute and delayed.
No known acute or delayed effects from exposure to the product.

4.3 Indication of any immediate medical attention and special treatment needed.

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In case of doubt or when symptoms of feeling unwell persist, get medical attention. Never administer anything orally to persons who are unconscious.

SECTION 5: FIREFIGHTING MEASURES.

5.1 Extinguishing media.
Suitable extinguishing media:
Extinguisher powder or CO2. In case of more serious fires, also alcohol-resistant foam and water spray.

Unsuitable extinguishing media:
Do not use a direct stream of water to extinguish. In the presence of electrical voltage, you cannot use water or foam as extinguishing media.

5.2 Special hazards arising from the substance or mixture.
Special risks.
Exposure to combustion or decomposition products can be harmful to your health.

5.3 Advice for firefighters.
Use water to cool tanks, cisterns, or containers close to the heat source or fire. Take wind direction into account.

Fire protection equipment.
According to the size of the fire, it may be necessary to use protective suits against the heat, individual breathing equipment, gloves, protective goggles or facemasks, and boots.

SECTION 6: ACCIDENTAL RELEASE MEASURES.

6.1 Personal precautions, protective equipment and emergency procedures.
For exposure control and individual protection measures, see section 8.

6.2 Environmental precautions.
Product not classified as hazardous for the environment, avoid spillage as much as possible.

6.3 Methods and material for containment and cleaning up.
Contain and collect spillage with inert absorbent material (earth, sand, vermiculite, Kieselguhr...) and clean the area immediately with a suitable decontaminant.
Deposit waste in closed and suitable containers for disposal, in compliance with local and national regulations (see section 13).

6.4 Reference to other sections.
For exposure control and individual protection measures, see section 8.
For later elimination of waste, follow the recommendations under section 13.

SECTION 7: HANDLING AND STORAGE.

7.1 Precautions for safe handling.
The product does not require special handling measures, the following general measures are recommended:
For personal protection, see section 8.
In the application area, smoking, eating, and drinking must be prohibited.
Follow legislation on occupational health and safety.
Never use pressure to empty the containers. They are not pressure-resistant containers. Keep the product in containers made of a material identical to the original.

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7.2 Conditions for safe storage, including any incompatibilities.
The product does not require special storage measures.As general storage measures, sources of heat, radiation, electricity and contact with food should be avoided.
Keep away from oxidising agents and from highly acidic or alkaline materials.
Store the containers between 5 and 35 º C, in a dry and well-ventilated place.
Store according to local legislation. Observe indications on the label. Once the containers are open, they must be carefully closed and placed vertically to prevent spills.

The product is not affected by Directive 2012/18/EU (SEVESO III).

7.3 Specific end use(s).
None in particular.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION.

8.1 Control parameters.

The product does NOT contain substances with Professional Exposure Environmental Limit Values.The product does NOT contain substances with Biological Limit Values.
8.2 Exposure controls.

Measures of a technical nature:

Concentration:	**100 %**
Uses:	**Chlorine stabilizer**
Breathing protection:	
If the recommended technical measures are observed, no individual protection equipment is necessary.	
Hand protection:	
If the product is handled correctly, no individual protection equipment is necessary.	
Eye protection:	
If the product is handled correctly, no individual protection equipment is necessary.	
Skin protection:	
PPE:	Work footwear.
Characteristics:	«CE» marking, category II.
CEN standards:	EN ISO 13287, EN 20347
Maintenance:	This product adapts to the first user's foot shape. That is why, as well as for hygienic reasons, it should not be used by other people.
Observations:	Work footwear for professional use includes protection elements aimed at protecting users against any injury resulting from an accident

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES.

9.1 Information on basic physical and chemical properties.
Physical state: Solid - Dust
Colour: White
Odour: Odourless
Odour threshold: Not applicable/Not available due to the nature/properties of the product
Melting point: > 360 ºC
Freezing point: Not applicable/Not available due to the nature/properties of the product
Boiling point or initial boiling point and boiling range: >300 ºC
Flammability: Not applicable/Not available due to the nature/properties of the product
Lower explosion limit: Not applicable/Not available due to the nature/properties of the product
Upper explosion limit: Not applicable/Not available due to the nature/properties of the product
Flash point: 433 ºC (Estimation based on the indication of the Regulation (CE) Nº1272/2008.)

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Auto-ignition temperature: Not applicable/Not available due to the nature/properties of the product
Decomposition temperature: Not applicable/Not available due to the nature/properties of the product
pH: 2,1 - 3 (20 ºC)
Kinematic viscosity: Not applicable/Not available due to the nature/properties of the product
Solubility: Not applicable/Not available due to the nature/properties of the product
Hydrosolubility: 2000 mg/l (25ºC)
Liposolubility: Not applicable/Not available due to the nature/properties of the product
Partition coefficient n-octanol/water (log value): - 1.31 (25ºC)
Vapour pressure: Not applicable/Not available due to the nature/properties of the product
Absolute density: Not applicable/Not available due to the nature/properties of the product
Relative density: 1.75
Relative vapour density: Not applicable/Not available due to the nature/properties of the product
Particle characteristics: Not applicable/Not available due to the nature/properties of the product

9.2 Other information
Viscosity: Not applicable/Not available due to the nature/properties of the product
Explosive properties: Not applicable/Not available due to the nature/properties of the product
Oxidizing properties: No
Dropping point: Not applicable/Not available due to the nature/properties of the product
Blink: Not applicable/Not available due to the nature/properties of the product

SECTION 10: STABILITY AND REACTIVITY.

10.1 Reactivity.
The product does not present hazards by their reactivity.

10.2 Chemical stability.
Unstable in contact with:
- Bases.

10.3 Possibility of hazardous reactions.
Neutralization can occur on contact with bases.

10.4 Conditions to avoid.
- Avoid contact with bases.

10.5 Incompatible materials.
Avoid the following materials:
- Bases.

10.6 Hazardous decomposition products.
Depending on conditions of use, can be generated the following products:
- Corrosive vapors or gases.

SECTION 11: TOXICOLOGICAL INFORMATION.

11.1 Information on hazard classes as defined in Regulation (EC) Nº 1272/2008.

Toxicological information.

Name	Acute toxicity			
	Type	Test	Kind	Value
cyanuric acid	Oral	LD50	Rat	> 5000 mg/kg
	Dermal	LD50	Rat	> 5000 mg/kg

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CAS No: 108-80-5 EC No:	Inhalation	LC50	Rat	> 5.25 mg/l

a) acute toxicity;
Not conclusive data for classification.

b) skin corrosion/irritation;
Not conclusive data for classification.

c) serious eye damage/irritation;
Not conclusive data for classification.

d) respiratory or skin sensitisation;
Not conclusive data for classification.

e) germ cell mutagenicity;
Not conclusive data for classification.

f) carcinogenicity;
Not conclusive data for classification.

g) reproductive toxicity;
Not conclusive data for classification.

h) STOT-single exposure;
Not conclusive data for classification.

i) STOT-repeated exposure;
Not conclusive data for classification.

j) aspiration hazard;
Not conclusive data for classification.

11.2 Information on other hazards.
Endocrine disrupting properties
This product does not contain components with endocrine-disrupting properties with effects on human health.
Other information
There is no information available on other adverse health effects.

SECTION 12: ECOLOGICAL INFORMATION.

12.1 Toxicity.

Name	Ecotoxicity			
	Type	Test	Kind	Value
cyanuric acid	Fish	LC50	Fish	2100 mg/l (96 h)
	Aquatic invertebrates			
CAS No: 108-80-5 EC No:	Aquatic plants	EC50	Algae	3780 mg/l (96 h)

12.2 Persistence and degradability.
No information is available regarding the biodegradability
No information is available on the degradability

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No information is available about persistence and degradability of the product.

12.3 Bioaccumulative potential.
No information is available regarding the bioaccumulation.

12.4 Mobility in soil.
No information is available about the mobility in soil.
The product must not be allowed to go into sewers or waterways.
Prevent penetration into the ground.

12.5 Results of PBT and vPvB assessment.
No information is available about the results of PBT and vPvB assessment of the product.

12.6 Endocrine disrupting properties.
This product doesn't contain components with environmental endocrine disrupting properties.

12.7 Other adverse effects.
No information is available about other adverse effects for the environment.

SECTION 13: DISPOSAL CONSIDERATIONS.

13.1 Waste treatment methods.
Do not dump into sewers or waterways. Waste and empty containers must be handled and eliminated according to current, local/national legislation.
Follow the provisions of Directive 2008/98/EC regarding waste management.

SECTION 14: TRANSPORT INFORMATION.

Transportation is not dangerous. In case of road accident causing the product's spillage, proceed in accordance with point 6.

14.1 UN number or ID number.
Transportation is not dangerous.

14.2 UN proper shipping name.
Description:
ADR/RID: Not classified as hazardous for transport.
IMDG: Not classified as hazardous for transport.
ICAO/IATA: Not classified as hazardous for transport.

14.3 Transport hazard class(es).
Transportation is not dangerous.

14.4 Packing group.
Transportation is not dangerous.

14.5 Environmental hazards.
Transportation is not dangerous.
Transport by ship, FEm – Emergency sheets (F – Fire, S - Spills): Not applicable.

14.6 Special precautions for user.
Transportation is not dangerous.

14.7 Maritime transport in bulk according to IMO instruments.
Transportation is not dangerous.

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SECTION 15: REGULATORY INFORMATION.

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.
The product is not affected by the Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer.

Volatile organic compound (VOC)
VOC content (p/p): 0 %
VOC content: 0 g/l

Product classification according to Annex I of Directive 2012/18/EU (SEVESO III): N/A
The product is not affected by Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products.
The product is not affected by the procedure established Regulation (EU) No 649/2012, concerning the export and import of dangerous chemicals.

Kind of pollutant to water (Germany): nwg: Non-hazardous to water. (Autoclassified according to the AwSV Regulations)

15.2 Chemical safety assessment.
No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.
Available Product Exposure Scenario.

SECTION 16: OTHER INFORMATION.

Changes regarding to the previous version:

- National legislative changes (SECTION 15.1).

Classification and procedure used to derive the classification for mixtures according to Regulation (EC) 1272/2008 [CLP]:

Physical hazards	On basis of test data
Health hazards	Calculation method
Environmental hazards	Calculation method

It is recommended that the product only be employed for the purposes advised.

Available Product Exposure Scenario.

Abbreviations and acronyms used:
AwSV: Facility Regulations for handling substances that are hazardous for the water.
CEN: European Committee for Standardization.
EC50: Half maximal effective concentration.
PPE: Personal protection equipment.
LC50: Lethal concentration, 50%.
LD50: Lethal dose, 50%.
WGK: Water hazard classes.

Key literature references and sources for data:
http://eur-lex.europa.eu/homepage.html
http://echa.europa.eu/
Regulation (EU) 2020/878.

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Regulation (EC) No 1907/2006.
Regulation (EU) No 1272/2008.

The information given in this Safety Data Sheet has been drafted in accordance with COMMISSION REGULATION (EU) 2020/878 of 18 June 2020 amending Annex II to Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemical substances and mixtures (REACH).

The information in this Safety Data Sheet on the Preparation is based on current knowledge and on current EC and national laws, as far as the working conditions of the users is beyond our knowledge and control. The product must not be used for purposes other than those that are specified without first having written instructions on how to handle. It is always the responsibility of the user to take the appropriate measures in order to comply with the requirements established by current legislation. The information contained in this Safety Sheet only states a description of the safety requirements for the preparation, and it must not be considered as a guarantee of its properties.

-End of safety data sheet.-

1.1 Identified uses

Table 1. Description of identified uses

Identified use	**Sector of Use (SoU)**	**Preparation Category (PC)**	**Process category (PROC)**	**Article category (AC)**	**Environmental Release Category (ERC)**
Intermediate	SU 8	PC 19	PROC 1 PROC 4 PROC 5	NA	ERC 1 ERC 2:
Stabilizer for swimming pool disinfection	SU 21	PC 37	PROC 8 PROC 9 PROC 14	NA	ERC 1 ERC 2
Plastic formulation ingredient	SU 12	PC 32	PROC 6 PROC 14	NA	ERC 2

1.2 Uses advised against

Currently there are no uses of CYA which are advised against.

2 HUMAN HEALTH HAZARD ASSESSMENT

2.1 Toxicokinetics (absorption, metabolism, distribution and elimination)

2.1.1 Non-human information

Table 2. Toxicokinetics, metabolism and distribution

Radiochemical	Route	Species, strain, sex, No./Group	Dose level, mg/kg bw Holding period	Recovery (%) Total	Urine	Faeces	CO_2	Retained dose (%)	Reference
^{14}C-sodium cyanurate monohydrate (77.5% cyanuric acid)	i.v. oral oral oral	Rat, Sprague-Dawley, 5 /sex/dose/group CO_2 collection group: 2 /sex/dose 15 day dose (no kinetics or peak blood conc. monitoring)	5 5 500 5, radiolabelled only on 15th day	100%	>95% >95% 30% males /45% females >95%	< 5% < 5% 70% males /55% females < 5%	trace	not detectable	Chadwick MD, Hayes D, Branfman AR, McComish MF, Macauley JB, Mazrimas MJ (1982)
^{14}C-sodium cyanurate monohydrate (77.5% cyanuric acid)	i.v. oral oral oral	Dog, Beagle, 4 /sex/group, 15 day with 2 /sex/dose	5 5 500 5 for 14 days and radiolabelled on 15th day, except one female with 4.5 radiolabelled	81-101%	>98% >98% 14-73% remainder	< 2% < 2% remainder 6-13%		not detectable	Chadwick M, Hayes D, McComish MF, Macauley JB, Mazrimas MJ (1982)
^{14}C-cyanuric acid	oral	Rat, Wistar, male, 3/group	Single dose: 50 µCi/0.410 mg/mL/kg 0.25 h 0.5 h 1 h 3 h 6 h 12 h	 -- -- -- 70% 88% 90%	 0% 9% 19% 63% 87% 89%	 0% 0% < 1% < 1% < 1% 1%	 NR	Stomach and intestines: 60% 20% 20% 7% 1% < 1%	Inokuchi N, et al (1978)

Table 3. Dermal absorption (animal data)

Radiochemical	Species, strain, sex, No./Group	Dose level, mg/kg bw, Holding period	Recovery Total	Urine	Blood	Skin	Washings	Reference

Radiochemical	Species, strain, sex, No./Group	Dose level, mg/kg bw, Holding period	Recovery Total	Urine	Blood	Skin	Washings	Reference
^{14}C-cyanuric acid	Rat, Sprague-Dawley Guinea-pig Human abdominal skin Testskin®	1 µCi or 100 µCi ^{14}C-CYA 55 mg/l CYA :1.5 mg/l chlorine : 100 ml water 24 hours	Human skin = 0.2 mg/day absorbed Rat: max permeation = 0.06 µg/cm^2/h Guinea-pig: max permeation = 0.01 µg/cm^2/h			Human: 0% Rat: max 0.05% Guinea-pig: max 0.17%	Human: 0% Rat: max 0.23% Guinea-pig: 0%	Moody RP et al (1993)
^{14}C-cyanuric acid	Rat, Wistar, male, 3/group	0.0021 mg/kg bw 6 h application 9 h application 12 h application	 87.54% 84.74% 86.73%	 0.008% 0.007% 0.009%	 Not detected Not detected Not detected	 2.24% 2.71% 1.24%	 85.29% 82.02% 85.48%	Inokuchi N, et al (1978)

2.1.2 Human information

Table 4. Oral (human data)

Radiochemical	Route	Species, strain, sex, No./Group	Dose level, mg/kg bw, Holding period	Recovery (%) Total	Urine	Reference
Cyanuric acid	oral	Human 2	21.4 mg	100%	100%	Duncan RC (1980)
Cyanuric acid	oral	Human Children (6 - 17 years): 20 males/21 females Adults: 4 male/8 female	Dosage variable – normal exposure rate from swimming pool water maintained at 30 – 50 mg/l CYA 45 minutes		> 98%	Dufour AP et al (2006)

Table 5. Dermal absorption (human data)

Radiochemical	Species, strain, sex, No./Group	Dose level, mg/kg bw, Holding period	Recovery (urine)	Reference
Cyanuric acid	Human			Duncan RC (1980)

Radiochemical	Species, strain, sex, No./Group	Dose level, mg/kg bw, Holding period	Recovery (urine)	Reference
	Swimming trial: 55 male/female (9-19 years) 11 male/female (9-37 years) Dermal study: 4 males	30 mg/l Control: 1 mg/l 30 mg/l (1 hour)	90% 0.25 mg/h	
Cyanuric acid	Human 1 male, 4 female 9 – 17 years	Dosage variable – normal exposure rate from swimming pool water. 120 min	0.03 – 2.8 mg	Allen L et al (1982)

2.1.3 Summary and discussion on toxicokinetics

Cyanuric acid (CYA) is a weak acid, with three ionizable protons. In aqueous solution, the dissociation of CYA is described by the three dissociation constants pKa1, pKa2 and pKa3 given in Table 4. At neutral pH (7.0) about 43% of the cyanuric acid in solution is present as cyanuric acid and 57% is present as the cyanurate ion. Thus, toxicity data for cyanuric acid or sodium cyanurate are equivalent, when expressed on a CYA basis.

Studies have been conducted on the absorption, distribution, metabolism and excretion of radiolabelled sodium cyanurate (equivalent to 77.5% CYA) after single i.v. and repeated oral administration. No metabolism or accumulation was demonstrated in either of the two animal studies in dogs and rats with 100% of the radioactive label recovered in urine and faeces. Over 98% of the cyanuric acid was absorbed from the GI tract. The findings of the animal studies are upheld in a pilot study in humans ingesting swimming pool water where > 98% of a measured dose of CYA was recovered in urine within 24 hours of dosing (Dufour et al 2006). In oral ingestion studies in 2 volunteers, total recovery of cyanuric acid was 21 and 21.2 mg and interpolated 90% excretion was at 3.1 or 3.5 h ($t_{1/2}$ ~ 1 h). The volunteers ingested 100 ml of water containing 214 ppm cyanurate (or 21.4 mg cyanurate) thus essentially 100% was recovered in the urine.

In dermal absorption studies where human skin was tested with a pool concentration of unlabelled cyanuric acid and chlorine, only 0.06 μg/cm^2 total cumulative absorption was detected over the 24 h exposure period (Moody et al 1993). Employing a value of 1.83 m^2 for the total body surface area of a 70 kg human, would imply an exposure of 1.1 mg for a 24 h exposure period. Assuming a worse case maximum exposure time of 5 h daily the data suggests that 0.2 mg/day would be absorbed through a swimmers skin. For a standard water cyanuric acid concentration of 55 ppm, 0.2 g of cyanuric acid would be contained in 3.6 mL pool water. Therefore exposure by the oral route could easily supersede that of dermal.

2.2 Acute toxicity

2.2.1 Acute toxicity: oral

Table 6. Acute oral toxicity

Route	Test material	Method, Guideline	Species, strain, sex, No./Group	Dose levels, Duration of exposure	Values LD50/LC50	References
Oral	Crude CYA*	Comparable to OECD 401	rat, Sprague-Dawley, 5 /sex	5000 mg/kg bw	> 5000 mg/kg bw	Branch DK (1981)

* Crude CYA = contains ~80% CYA, ~15% ammelide, ~4% ammelide, remainder = melamine, urea and biuret

2.2.2 Acute toxicity: dermal

Table 7. Acute oral toxicity

Route	Test material	Method, Guideline	Species, strain, sex, No./Group	Dose levels, Duration of exposure	Values LD50/LC50	References
Dermal	Crude CYA	Comparable to OECD 402	rabbit, New Zealand white, 5 /sex	5000 mg/kg bw, 24 hr	> 5000 mg/kg bw	Branch DK (1981)

2.2.3 Acute toxicity: inhalation

Table 8. Acute inhalation toxicity

Route	Test material	Method, Guideline	Species, strain, sex, No./Group	Dose levels, Duration of exposure	Values LD50/LC50	References
Inhalation	CYA	OECD 403	rats, Sprague Dawley 5 /sex	5.25 mg/L 4 hr	> 5.25 mg/L	Younger N (2009)

2.2.4 Summary and discussion of acute toxicity

Acute oral and dermal studies were performed in male and female rats with Crude CYA (Branch 1981). No mortalities were observed in either sex at 5000 mg/kg following oral administration. No mortalities were observed following dermal application of 5000 mg/kg to the shaved and abraded dorsal surface of albino rabbits of both sexes. An acute inhalation study (nose only exposure) with CYA gave an LC50 > 5.25 mg/L. CYA is not classified for acute oral, dermal or inhalation exposure.

2.3 Irritation

2.3.1 Skin

Table 9. Skin irritation

Species	Test material	Method	Average score 24, 48, 72 h		Reversibility (yes/no)	Result	References
			Erythema	Oedema			
Rabbit	Crude CYA	Comparable to US FIFRA (intact and abraded skin)	0	0	Not applicable	Not irritating	Branch DK (1981)

2.3.2 Eye

Table 10. Eye irritation

Species	Test material	Method	Average score 24, 48, 72 h			Result	Reversibility (yes/no)	References
			Cornea opacity	Iris inflammation	Conjunctiva redness			
Rabbit	Crude CYA	Not stated	0.0, 0.0, 0.0	0.0, 0.0, 0.0	0.7, 0.3, 0.0	Not irritating	Yes	Branch DK (1981)

2.3.3 Respiratory tract

No data

2.3.4 Summary and discussion of irritation

Skin irritation

In an *in vivo* skin irritation study (Branch 1990) 500 mg cyanuric acid was applied to the abraded skin of 6 New Zealand White rabbits under an occlusive patch for 24 hours. Animals were observed after removal of the patch up to 72 h. The average of the erythema and edema assessments for the 6 animals after 72 h was 0.0. Calcium sulfate was found to be non-irritating to the skin in rabbits.

Eye irritation

In an *in vivo* eye irritation study (Branch 1981) 82 mg cyanuric acid was instilled into the eyes of 6 New Zealand White rabbits. Ocular observations were made at 24, 48 and 72 h after instillation. The average of the Draize scores for 24, 48 and 72 h was 0.3. All irritation had subsided by 72 h after exposure. No corneal or iridal involvement was observed. Cyanuric acid is not irritating to eyes.

2.4 Corrosivity

No signs of corrosivity were observed in the irritation studies. CYA is not corrosive.

2.5 Sensitisation

2.5.1 Skin

Table 11. Skin sensitisation – Local Lymph Node Assay

Species	Method	Stimulation index (SI)			Result	References
		25%	50%	100%		
Mouse	Local lymph node assay	2.1	3.4	3.7	Weak sensitizer*	Kuhn JO (2008)

	(LLNA) OECD 429					

* Refer to section 5.5.3 for additional discussion

2.5.1.1 Human information

Though no human studies are available for CYA information from historical use is available. No known incidents or complaints of skin sensitisation were recalled from workers handling CYA in manufacture or application of the product. No known incidents or complaints of post application exposure to swimmers attributed specifically to CYA in swimming pools were recalled. The maximum recommended CYA levels in swimming pools are typically 100 ppm (WHO Guidelines For Safe Recreational Water Environments, 2000) or less which is well below the levels tested in the LLNA study 25% (250 000 ppm) which did not elicit a positive response.

2.5.2 Respiratory system

No data

2.5.3 Summary and discussion of sensitisation

The results of the LLNA study (Kuhn JO 2008) indicated that CYA elicited a positive response for potential skin sensitization, based on test/vehicle control ratio or stimulation index (SI) of 3 or greater in two of the three concentrations tested (50% and 100%). These positive results were considered indicators of borderline or mild skin sensitization potential. The test group at 25% CYA was below the SI of 3 threshold for a positive response. The severity of response was low, just above the SI threshold of 3 for only two of the three concentrations tested, which were considered borderline positive. In addition, the response at 25% CYA was below this threshold and not considered a positive response. On this basis CYA should not be classified as a skin sensitizer.

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2.6 Repeated dose toxicity

2.6.1 Repeated dose toxicity: oral

Table 12. Repeat dose drinking water studies

Route	Test substance	Duration of study	Species, strain, sex, no./group	Dose levels, frequency of application	Results	LO(A)EL	NO(A)EL	References
drinking water	monosodium cyanurate monohydrate (CYA 77.34%)	28 days extended to 59 days	Rat, CD, 5 /sex/dose (10/sex control)	400, 1200, 2000, 4000 mg/l ad libitum (males: 48.8, 141.4, 260.1, 520.7 mg/kg bw/d; females: 64.5, 264.2, 370.4, 717.0 mg/kg bw/d)	No dose related indications of toxicity observed.	> 4000 ppm (males 521 mg/kg bw/d; females 717 mg/kg bw/d)	ca. 4000 mg/l (males 521 mg/kg bw/d; females 717 mg/kg bw/d)	Biava C (1980)
drinking water	monosodium cyanurate monohydrate (CYA 77.34%)	90 days	Rat, CD, 40/sex/dose except 896 & 1792 with 24 /sex/dose	0, 896, 1792, 5375 mg/l, ad libitum (based on total s-triazinetriol content	No mortalities. Hyperplasia of urinary bladder epithelium of males. NOAEL based on observation of slight hyperplasia in one male at the mid-dose level.	1792 mg/l (males = 231mg/kg bw/day)	896 mg/l (males = 109 mg/kg bw/day)	Rajasekaran D (1981)
drinking water	monosodium cyanurate monohydrate (CYA 77.4%)	104 weeks	Rat, CD, Control:100 /sex 400 ppm: 80/sex other doses: 100/sex/dose	0, 400, 1200, 2400, 5375 ppm	Some males were more susceptible during the early stages of the study to substance related effects than females. High: heart and urinary tract lesions in males during first 12 months.	5375 ppm (males = 371 mg/kg bw/day, females = 634 mg/kg bw/day)	2400 ppm (males = 154 mg/kg bw/day, females = 266 mg/kg bw/day)	Blair M (1985)
drinking water	monosodium cyanurate monohydrate (CYA 77.5%)	104 weeks	mice, $B_6C_3F_1$ Control:100 /sex 100 ppm: 80/sex other doses: 100/sex/dose	0, 100, 400, 1200, 5375 ppm	No significant toxicological effects noted.	> 5375 ppm (males = 1523 mg/kg bw/day, females = 1582 mg/kg bw/day)	5375 ppm (males = 1523 mg/kg bw/day, females = 1582 mg/kg bw/day)	Serota DG (1986)

2.6.2 Summary and discussion of repeated dose toxicity

Subchronic and chronic drinking water studies were performed with monosodium cyanurate (77.34 - 77.5% CYA) and concentrations corrected accordingly. For CYA, the NOAEL for sub-chronic effects (90-days) is 109 mg/kg bw/day for males based on hyperplasia in the urinary bladder observed in one male in the mid-dose group (Rajasekaran D 1981) The hyperplasia in males observed in the sub-chronic study has been elucidated in the 2-year combined chronic toxicity and cytogenicity study (Blair M 1985) where it was seen that male rats were more susceptible to dose related effects during the early stages of the study with reversal of effects over the full dosing period. The No Observed Effect Level (NOEL) in males was identified as 154 mg/kg bw/day and the Lowest Observed Adverse Effect Level in the male was 371 mg/kg bw/day). The low sub-chronic NOAEL (109 mg/kg bw/day, male) should be considered as redundant based on the findings of the 2-year chronic study. The NOEL for males of 154 mg/kg bw/day from the 2-year combined chronic toxicity/carcinogenicity study is applicable for risk characterisation as a precautionary approach.

2.7 Mutagenicity

2.7.1 In vitro data

Table 13. In vitro genotoxicity

Test system, Method guideline	Test substance	Organism/ strain(s)	Concentrations tested	Result		References
				+S9	-S9	
Ames Test, Comparable to OECD 471	monosodium cyanurate monohydrate (CYA 77.34%)	*Salmonella typhimurium*: TA98, TA100, TA1535, TA1537	0.01, 0.04, 0.2, 1, 3, 10 mg/plate	-ve	-ve	Gridley J, Ross WD (1980)
Mouse lymphoma assay, Comparable to OECD 476	monosodium cyanurate monohydrate (CYA 77.34%)	L5178Y TK+/- mouse lymphoma cells	+S9: 250, 500, 750, 1000, 1250, 1500, 1750, 2000; -S9: 50, 100, 250, 500, 750, 1000, 1250, 1500, 1750, 2000 µg/ml	-ve	-ve	Kirby PE (1981)
Sister chromatid exchange assay, Comparable to OECD 479	monosodium cyanurate monohydrate (CYA 77.34%)	Chinese hamster ovary cells, ATCC CCL 61, CHO-K1	93.8, 187.5, 375, 750, 1500 µg/ml	-ve	-ve	Stewart BE (1981)

2.7.2 In vivo data

Table 14. In vivo genotoxicity

Type of test Method/ Guideline	Test substance:	Species, strain, sex, no./group	Dose levels	Sampling times	Results	References
Mammalian Bone Marrow Chromosome Aberration Test. Comparable to OECD 475	monosodium cyanurate monohydrate (CYA 77.5%)	Rat, Sprague-Dawley, male, 10/dose	0, 1.25, 2.50, 5.0 g/kg bw	24 or 46 hours	-ve	Sharma RK (1981)

2.7.3 Summary and discussion of mutagenicity

In vitro gene mutation study in bacteria:

Monosodium cyanurate monohydrate was tested in a bacterial reverse mutation assay (Gridley and Ross 1980) in *S. typhimurium* strains TA100, TA1535, TA1537, TA97, TA98 and TA100 in a plate incorporation assay and spot test with and without metabolic activation (S9). Cyanuric acid was not mutagenic towards *Salmonella typhimurium*test strains in the plate incorporation or spot tests conducted with or without a rat microsomal activation system. No microbial toxicity was observed with or without microsomal activation.

In vitro gene mutation study in mammalian cells:

The sodium salt of cyanuric acid was tested for its abilty to induce mutations in mouse lymphoma L5178Y cells in the presence and absence of metabolic activation (Kirby 1981). The test susbtance did not induce any toxicologically significant increases in the mutant frequency at the TK +/- locus in L5178Y cells and was therefore considered to be non mutagenic under the conditions of the test.

In vitro cytogenicity study in mammalian cells

Monosodium cyanurate was tested in a sister chromatid exchange assay (Stewart 1981) in cultured Chinese hamster ovary (CHO) cells Without metabolic activation, CHO cells were exposed to five concentrations of monosodium cyanurate ranging from 93.8 to 1500 µg/mL. With metabolic activation, CHO cells were exposed to monosodium cyanurate at five concentrations ranging from 93.6 to 1500 µg/mL. Monosodium cyanurate did not induce SCEs in CHO cells with or without metabolic activation.

In vivo micronucleus assay:

In a reliable OECD guideline study (Sharma 1981) male mice were given 1.25, 2.50 and 5.00 g/kg bw doses of sodium cyanurate. No mutagenic effects were observed at 24 or 48 hours post dosing, in the bone marrow cells of male rats dosed orally with 1.25, 2.5, or 5.00 g/kg sodium cyanurate.

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2.8 Carcinogenicity

2.8.1 Carcinogenicity: oral

Table 15. Carcinogenicity in rat and mouse

Route	Test substance	Duration of study	Species, strain, sex, no./group	Dose levels, frequency of application	Tumours and non-neoplastic lesions	References
drinking water	monosodium cyanurate monohydrate (CYA 77.4%)	104 weeks	Rat, CD Control:100 /sex 400 ppm: 80/sex other doses: 100/sex/dose	0, 400, 1200, 2400, 5375 ppm ad libitum	Test substance related non-neoplastic lesions were only observed in the urinary tract in males from the 5375 mg/l group sacrificed at the 6 and 12 month interims.	Blair M (1985)
drinking water	monosodium cyanurate monohydrate (CYA 77.5%)	104 weeks	mice, $B_6C_3F_1$ Control:100 /sex 100 ppm: 80/sex other doses: 100/sex/dose	0, 100, 400, 1200, 5375 ppm, ad libitum	No definitive treatment-related effects were observed at any of the dose levels tested.	Serota DG (1986)

2.8.2 Summary and discussion of carcinogenicity

Two carcinogenicity drinking water studies with monosodium cyanurate monohydrate (77.4 - 77.5% CYA) were performed, one in the rat and the other in the mouse. In both studies there is no evidence of carcinogenic potential of the test material. The lowest NOEL derived was that in male rats 154 mg/kg bw/day (Blair M 1985) due to test substance related urinary tract lesions which occurred in the first half of the study. At the highest dose, the test substance precipitated in the urinary bladder. No treatment related effects were observed in the study performed with mice.

2.9 Toxicity for reproduction

2.9.1 Effects on fertility

Table 16. Two generation developmental toxicity

Route	Test substance	Test type Method Guideline	Species, strain, sex, no. /group	Exposure period	Doses	Critical effects	NO(A)EL parental	NO(A)EL F1	NO(A)EL F2	References
							m & f	m & f	m & f	
drinking water	sodium cyanurate monohydrate (CYA 77.05%)	2-generation. Comparable to OECD 416	Rat, CD, 12 male & 24 female /dose	103 weeks	0, 400, 1200, 5375 ppm	No consistent adverse effects to reproductive parameters or off-spring toxicity. Reduced NOAEL for F2 males is in relation to an increased incidence of calculi in the urinary bladder related to the test article.	5375 ppm (males = 470 mg/kg bw/day, females = 950 mg/kg bw/day)	5375 ppm (males = 500 mg/kg bw/day, females = 910 mg/kg bw/day)	1200 ppm Males (190 mg/kg bw/day) 5375 ppm, females (970 mg/kg bw/day)	Aldridge D et al. (1985)

2.9.2 Developmental toxicity

Table 17. Teratogenicity

Route	Test substance	Test type, Method Guideline	Species, strain, sex, no. /group	Exposure period	Doses	Critical effects, dams, fetuses	NO(A)EL maternal toxicity	NO(A)EL Teratogenicity embryotoxicity	References
gavage	monosodium cyanurate	Comparable to OECD 414	rabbit, New Zealand white, female 20/dose group	Days 6 to 18 of gestation	0, 20, 50, 200, 500 mg/kg bw/day	Dams: reduced bodyweight gains. No adverse effect on teratology or fetotoxicity.	> 500 mg/kg bw/day	≥500 mg/kg bw/day	Rodwell DE (1990)
gavage	monosodium cyanurate monohydrate (CYA 77.4%)	Comparable to OECD 414	rat, CD, female, 25 /dose group	Days 6 to 15 of gestation	200, 1000, 5000 mg/kg bw/day	No adverse effect on teratology or fetotoxicity.	> 5000 mg/kg bw/day	≥ 5000 mg/kg bw/day	Laughlin KA (1982)

2.9.3 Summary and discussion of reproductive toxicity

In a two generation rat study, the NO(A)EL for adult toxicity of the monosodium cyanurate is 5375 ppm corrected to CYA concentrations (males = 470 mg/kg bw/day, females 910 mg/kg/day) with the exception of F_2 males where the NOEL = 1200 ppm (190 mg/kg/day). This is based on the related incidence of calculi in the urinary bladders of high dose animals seen at the highest dose level. Effects on the urinary tract in male rats were also observed in the repeat oral dose toxicity studies. Monosodium cyanurate did not produce any consistent effects on reproductive parameters or offspring toxicity; therefore 5375 ppm (470 – 500 mg/kg bw/day for males and 910 – 970 mg/kg bw for females) is assessed as the NOEL for reproductive and offspring effects.

In the rabbit study, NO(A)EL maternal toxicity based on the statistical significance of the toxicological observations is 500 mg/kg bw/day. However, there was no evidence of developmental toxicity in any of the treated groups. Hence the NO(A)EL for developmental toxicity was assessed to be at least 500 mg/kg bw/day.

In the rat study, monosodium cyanurate did not produce a maternal toxicity or teratogenic response when administered by gavage at a dose of 5000 mg/kg bw/day or less.

2.10 Derivation of DNEL

2.10.1 Overview of typical dose descriptors for all endpoints

Table 18. Available dose descriptor(s) per endpoint for a certain substance as a result of its hazard assessment.

Endpoint		**Quantitative dose descriptor (appropriate unit) or qualitative assessment**		**Associated relevant effect**	**Remarks on study**
		Local	Systemic		
Acute toxicity	oral	LD50 >5000 mg/kg bw/day NOAEL(mat/ terat): >500 mg/kg/d	N/A	None observed	Acute oral in rats and oral teratology study in rabbits
	dermal	LD50 >5000 mg/kg bw/day	N/A	None observed	Acute dermal tox in rats
	inhalation	LC50 > 5.25 mg/L	N/A	None observed	Acute inhalation tox in rats
Irritation/Corrosivity	skin	N/A	NA	Not irritating	
	eye	N/A	NA	Not irritating	
Sensitisation	skin	Not sensitizing	NA	Not sensitizing	
Repeated dose toxicity sub-acute/ sub-chronic/ chronic	oral		NOEL 154 mg/kg bw/day*	High incidence of urinary bladder calculi observed in male rats and test article related heart and urinary tract lesions (first 12 months of study)	2-yr drinking water combined chronic toxicity/carcinogenicity study in rats
Mutagenicity	in vitro	Negative	N/A	Not mutagenic	
	in vivo	Negative	N/A	Not mutagenic	
Carcinogenicity	oral	Not carcinogenic		Not carcinogenic	
Reproductive toxicity fertility impairment	oral	NA			
Reproductive toxicity developmental tox	oral	NA			

*The NOEL value from the 2-year combined chronic toxicity/carcinogenicity study is applicable in the absence of a NOAEL value for systemic toxicity.

2.10.2 Correction of dose descriptors if needed (for example route-to-route extrapolation), application of assessment factors and derivation of the endpoint specific DN(M)EL

See section 5.10.3

2.10.3 Selection of the critical DNEL(s)/DMELs and/or qualitative/semi-quantitative descriptor for critical health effects

Table 19. :DNELs for workers

Exposure pattern	Route	Descriptors	DNEL/DMEL (appropriate unit)	Most sensitive endpoint
Acute - systemic effects	Dermal (mg/kg bw /day)	DNEL	3.08 mg/Kg (from chronic)	2 year repeat oral dose study
	Inhalation (mg/m^3)	DNEL	10.86 mg/m^3	2 year repeat oral dose study
Acute - local effects	Dermal (mg/cm^2)	N/A	N/A	
	Inhalation (mg/m^3)	N/A	N/A	
Long-term - systemic effects	Dermal (mg/kg bw /day)	DNEL	3.08 mg/Kg	2 year repeat oral dose study
	Inhalation (mg/m^3)	DNEL	10.86 mg/m³	2 year repeat oral dose study
Long-term – local effects	Dermal (mg/cm^2)	N/A	N/A	
	Inhalation (mg/m^3)	N/A	N/A	

Discussion – Derivation of DNELs for workers

Acute dermal local:
The acute dermal DNEL for local effects cannot be determined as irritation or corrosion data showing a dose response correlation is not available.

Acute inhalation local:
The acute inhalation DNEL for local effects couldn't be derived as the irritative potential of CYA on the respiratory tract was not tested

Acute dermal systemic:
The acute dermal DNEL for systemic effects is the same as that for long-term DNEL which is considered sufficient to ensure that these effects do not occur.

Acute inhalation systemic:
The acute inhalation DNEL for systemic effects is the same as that for the long term DNEL which is considered sufficient to ensure that these effects do not occur.

Long-term dermal systemic:
The long-term dermal DNEL for systemic effects is calculated based on a route to route extrapolation from a chronic oral drinking water study assuming complete absorption via the dermal route which is a very conservative assumption given the low dermal permeability (see chapter 5.1.3).
The starting value is the NOAEL (oral, rat chronic) of 154 mg/Kg.
The assessment factor is the product of:
- factor for route-to-route extrapolation: 1.0
- interspecies factor: 2.5
- allometric scaling: 4.0
- intra species factor for workers: 5
- total assessment factor (product of assessment factors): 50
- total factor (product of assessment factors x route-to-route factor): 50
- derived long-term dermal DNEL for systemic effects: 3.08 mg/Kg bw

Long-term inhalative systemic:
The long-term inhalation DNEL for systemic effects is calculated based on a route to route extrapolation from a chronic oral drinking water study.
The starting value is the NOAEL (oral, rat chronic) of 154 mg/Kg.
To convert this into a NAEC for workers the following calculation is applied:
154 mg/Kg /0.38 m^3/kg bw x 0.67m^3/10m^3 = 271.5 mg/m^3 (NAEC worker 8 h)

The assessment factor is the product of:
AF of 2.5 (default) for remaining interspecies differences.
AF of 5 is applied for intraspecies differences for workers
AF of 2 is applied for route to route extrapolation of oral to inhalation exposure
The total AF applied is obtained by multiplication of all the assessment factors (2.5 * 5 * 2) giving an overall assessment factor of 25.
The inhalation worker DNEL for systemic effects is 271.5/25 = 10.86 mg/m^3

Long-term dermal local:
The long-term dermal DNEL for local effects couldn't be derived as results from repeated dose experiments are not available for dermal toxicity.

Long-term inhalation local:
The long-term inhalation DNEL for local effects couldn't be derived as results from repeated dose experiments are not available for inhalation toxicity.

Mutagenicity/Carcinogenicity/Reproductive Toxicology:
Adverse effects were not found in any of the conducted studies concerning mutagenesis or carcinogenesis. In addition in a two generation study and in two teratogenicity studies only parental toxicity was found at levels well above the chronic oral NOAEL. Accordingly no DNEL- or

DMEL-values concerning mutagenesis, carcinogenicity or reproductive toxicology were derived.

DNELs for the general population

Exposure pattern	Route	Descriptors	DNEL/DMEL (appropriate unit)	Most sensitive endpoint
Acute - systemic effects	Dermal (mg/kg bw /day)	DNEL	1.54 mg/Kg	2 year repeat oral dose study
	Inhalation (mg/m^3)	DNEL	2.7 mg/m³	2 year repeat oral dose study
	Oral (mg/kg bw /day)	DNEL	1.54 mg/Kg	2 year repeat oral dose study
Acute - local effects	Dermal (mg/cm^2)	N/A		
	Inhalation (mg/m^3)	N/A		
Long-term - systemic effects	Dermal (mg/kg bw /day)	DNEL	1.54 mg/Kg	2 year repeat oral dose study
	Inhalation (mg/m^3)	DNEL	2.7 mg/m³	2 year repeat oral dose study
	Oral (mg/kg bw /day)	DNEL	1.54 mg/Kg	2 year repeat oral dose study
Long-term - local effects	Dermal (mg/cm^2)	N/A	N/A	
	Inhalation (mg/m^3)	N/A	N/A	

Discussion - Derivation of DNELs for the general population

Acute dermal local:
The acute dermal DNEL for local effects can not be determined as irritation or corrosion data showing a dose response correlation is not available.

Acute inhalative local:
The acute inhalation DNEL for local effects couldn't be derived as the irritative potential of CYA on the respiratory tract was not tested.

Acute inhalation local:
The acute inhalation DNEL for local effects couldn't be derived as the irritative potential of CYA on the respiratory tract was not tested

Acute dermal systemic:
The acute dermal DNEL for systemic effects is the same as that for long-term DNEL which is considered sufficient to ensure that these effects do not occur.

Acute inhalation systemic:
The acute dermal DNEL for systemic effects is the same as that for long-term DNEL which is considered sufficient to ensure that these effects do not occur.

Acute oral systemic:
The acute dermal DNEL for systemic effects is the same as that for long-term DNEL which is considered sufficient to ensure that these effects do not occur

Long-term dermal systemic:
The long-term dermal DNEL for systemic effects is calculated based on a route to route extrapolation from a chronic oral drinking water study assuming complete absorption via the dermal route which is a very conservative assumption given the low dermal permeability.
The starting value is the NOAEL (oral, rat chronic) of 154 mg/Kg.
The assessment factor is the product of:
- factor for route-to-route extrapolation: 1.0
- interspecies factor: 2.5
- allometric scaling: 4.0
- intra species factor for general public: 10
- total assessment factor (product of assessment factors): 100
- total factor (product of assessment factors x route-to-route factor): 100
- derived long-term dermal DNEL for systemic effects: 1.54 mg/Kg bw

Long-term inhalative systemic:

The long-term inhalation DNEL for systemic effects is calculated based on a route to route extrapolation from a chronic oral drinking water study.
The starting value is the NOAEL (oral, rat chronic) of 154 mg/Kg.
To convert this into a NAEC for the general population the following calculation is applied:
154 mg/Kg /4 x 70 kg bw /20 m^3 = 134.75 mg/m^3 (NAEC general public 24 h)
An assessment factor of 4 is applied to correct for differences in metabolic rate per body weight.
The following assessment factors are then applied.
AF of 2.5 (default) is applied for remaining interspecies differences.
AF of 10 is applied for intraspecies differences for the general public.
AF of 2 is applied for route to route extrapolation of oral to inhalation exposure.
The total AF applied is obtained by multiplication of all the assessment factors (2.5 * 10 * 2) giving an overall assessment factor of 50.
The inhalation general public DNEL for systemic effects is 134.75 mg/m^3 /50 = 2.7 mg/m^3.

Long-term oral systemic:
The long-term oral DNEL for systemic effects is calculated based a chronic oral drinking water study in rats.
The starting value is the NOAEL (oral, rat, chronic) of 154 mg/Kg.
The assessment factor is the product of:
- interspecies factor: 2.5
- allometric scaling: 4.0
- intra species factor for general public: 10
- total assessment factor (product of assessment factors): 100
- derived long-term oral DNEL for systemic effects: 1.54 mg/Kg bw

Long-term dermal local:
The long-term dermal DNEL for local effects couldn't be derived as results from repeated dose experiments are not available for dermal toxicity.

Long-term inhalative local:
The long-term inhalation DNEL for local effects couldn't be derived as results from repeated dose experiments are not available for inhalation toxicity.

Mutagenicity/Carcinogenicity/Reproductive Toxicology:
Adverse effects were not found in any of the conducted studies concerning mutagenesis or carcinogenesis. In addition in a two generation study and in two teratogenicity studies only parental toxicity was found at levels well above the chronic oral NOAEL. Accordingly no DNEL- or DMEL-values concerning mutagenesis, carcinogenicity or reproductive toxicology were derived.

3 HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICOCHEMICAL PROPERTIES

3.1 Explosivity

CYA does not contain any chemical groups identified as potentially explosive within the molecule and therefore is not expected to be explosive.

3.2 Flammability

CYA is not flammable as demonstrated in EU Method A.10. (Atwal SS & Tremain SP 2009)

3.3 Oxidising potential

The chemical structure of CYA establishes that it is incapable of reacting exothermically with a combustible material and therefore has no oxidizing potential.

4 ENVIRONMENTAL HAZARD ASSESSMENT

4.1 Aquatic compartment (including sediment)

4.1.1 Toxicity data

4.1.1.1 Fish

4.1.1.1.1 Short-term toxicity to fish

Table 20. Marine and freshwater fish acute studies

Guideline/ Test method	Test substance	Species	Exposure		Results (mg/l) measured			Ref.
			design	duration	LC_0	LC_{50}	LC_{100}	
Comparable to OECD 203	CYA	*Lepomis macrochirus*	static	96 h		>1000		Thompson CM, Forbis AD (1978a)
Comparable to OECD 203	CYA	*Salmo gairdneri*	static	96 h		>2100		Thompson CM, Forbis AD (1978b)
Comparable to OECD 203	CYA	*Pimephales promelas*	static	96 h		>2100		Thompson CM, Forbis AD (1978c)
EPA/600/4-90/027	CYA	Inland silversides	static	96 h		8000		Anderson K (2002)

4.1.1.1.2 Long-term toxicity to fish

Table 21. Fish juvenile growth test

Guideline/ Test method	Test substance	Species	Endpoint	Exposure duration	Results (mg/l) measured			Remarks	Ref.
					Effect	NOEC	LOEC		
OECD 215 Fish juvenile growth test	Monosodium salt of CYA (75.6% CYA)	Rainbow Trout	growth	21 days	No effects noted at limit dose	756 as CYA	> 756 as CYA	Zero mortalities, no inhibition of tank average specific growth rate, no sublethal effects of exposure and no significant reduction in terms of the "pseudo" specific growth rate when compared to the control group. Results corrected for cyanuric acid content. Test material equivalent to 75.6 % by weight of	Sewell IG, Mullee DM (2007)

								cyanuric acid. Fish exposed to dissolved and dispersed test material.	

4.1.1.2 Aquatic invertebrates

4.1.1.2.1 Short-term toxicity to aquatic invertebrates

Table 22. Toxicity to *Daphnia magna*

Guideline/ Test method	Test substance	Species	Exposure		Results (mg/l) measured			Ref.
			design	duration	EC_0	EC_{50}	EC_{100}	
Comparable to OECD 202	CYA	*Daphnia magna*	static	48 h		>1000		McAllister WA, Thompson CM (1978)

4.1.1.2.2 Long-term toxicity to aquatic invertebrates

Table 23. Reproduction test in *Daphnia magna*

Guideline / Test method	Test substance	Species	Endpoint	Exposure duration	Results (mg/l) measured		Remarks	Ref.
					NOEC	LC_{50}		
OECD 211	Monosodium salt of CYA (75.6% CYA)	*Daphnia magna*	Reproduction	21-days	121 as CYA	2117 as CYA (reproduction)	NOEC based on significant mortalities in the adult (F_1) generation and fewer live young per adult. Results corrected for cyanuric acid content. Test material equivalent to 75.6% by weight of cyanuric acid.	Sewell IG, Hill JWF (2007)

4.1.1.3 Algae and aquatic plants

Table 24. Algal toxicity

Guideline/ Test method	Test substance	Species	Endpoint	Exposure duration	Results (mg/l) measured		Remarks	Ref.
					NOEC	EC_{50}		
OECD 201	Monosodium salt of CYA (75.6% CYA)	*Navicula pelliculosa*	Growth	96 h	945 as CYA	3780 as CYA	The test material has a growth delaying effect on algal cells over the first 72 hours of the study. The cells recover after 96 hours to match control values. Results corrected for cyanuric acid content. Test material equivalent to 75.6% by weight of cyanuric acid.	Vryenhoef H, Hill JWF (2007)
ISO Guideline No. 10253 'Water Quality Marine Algal Growth Inhibition Test with *Skeletonema costatum* and *Phaeodactylum tricornutum'*	Monosodium salt of CYA (75.6% CYA)	*Skeletonema costatum*	Growth	96 h	>76 as CYA	76 as CYA	Based on nominal concentrations.	Vryenhoef H, Mullee D (2008)
Similar to US EPA (1971) Algal Assay Procedure: Bottle test	CYA	*Selenastrum capricornutum*	Phytotoxicity: Chlorophyll conc. Cell No.	96 h		 712 655	Nominal concentrations only. No NOEC concentration reported.	Hollister TA (1978)

4.1.1.4 Sediment organisms

Table 25. Toxicity to chironomid

Guideline/ Test method	Test material	Spp.	End point	Exposure duration		Results (mg/kg dwt) measured		Remarks	Ref.
				design	duration	NOEC	EC_{50}		
OECD 218	Monosodium salt of CYA (75.6% CYA)	Chironomid	emergence	static	28 days	756 as CYA	> 756 as CYA	Results corrected for cyanuric acid content. Test material equivalent to 75.6% by weight of cyanuric acid.	Goodband TJ, Mullee DM (2007)

4.1.1.5 Other aquatic organisms

Table 26. Toxicity to mysid shrimp

Guideline/ Test method	Test substance	Species	Exposure		Results (mg/l) measured			Remarks	Ref.
			design	duration	EC_0	EC_{50}	EC_{100}		
EPA/600/4-90/027	CYA	*Mysid shrimp*	static	48 h		4438		Nominal concentrations only.	Anderson K (2002)

4.1.2 Calculation of Predicted No Effect Concentration (PNEC)

4.1.2.1 PNEC water

Table 27. PNEC aquatic

	Value	Assessment factor	Remarks/Justification
PNEC aqua – freshwater (mg/l)	12.1	10	On the basis of acute and chronic toxicity data against fish, invertebrates and algae, it is possible to derive a PNEC for aquatic organisms from the lowest NOEC from chronic studies and applying a safety factor of 10. Based upon the available data the lowest NOEC for CYA is from the Daphnia reproduction study (121 mg/l).
PNEC aqua - marine water (mg/l)	1.52	50	Three long term NOECS are available for freshwater species plus one long term NOEC from the marine algal test. The lowest NOEC is from the marine algal test which gives a NOEC of 76 mg/L. An assessment factor of 50 is applied.

4.1.2.2 PNEC sediment

Table 28. PNEC sediment

	Value	Assessment factor	Remarks/Justification
PNEC sediment (mg/kg d.w.)	7.56	100	There were no effects at the limit dose level on Chironomid. The PNEC for sediment is derived by applying an assessment factor of 100 to lowest value, the NOEC or EC_{10}, from a long-term sediment study. In this case the NOEC and EC_{10} are both >= 756 mg/kg dwt.

4.2 Terrestrial compartment

4.2.1 Toxicity data

4.2.1.1 Toxicity to soil macro organisms

Table 29. Earthworm toxicity

Guideline/ Test method	Test substance	Spp.	Endpoint	Exposure duration	Results (mg/kg dwt) measured		Remarks	Ref.
					NOEC	LC_{50}		
OECD 207	Monosodium salt of CYA	Earth-worm	Acute toxicity	14-days	756 as CYA	>756 as CYA	Results corrected for cyanuric acid content. Test material equivalent to 75.6 % by weight of cyanuric acid.	Goodband TJ (2007)

CYA is not toxic to earthworms.

4.2.2 Calculation of Predicted No Effect Concentration (PNEC_soil)

Table 30. PNEC soil

	Value	**Assessment factor**	**Remarks/Justification**
PNEC soil (mg/kg.dwt.)	0.756	1000	The PNEC is derived from the LC50 earthworm acute toxicity as this is the only available terrestrial test.

4.3 Atmospheric compartment

The vapour pressure of CYA is 0.000001 Pa at 25°C. The calculated (see 4.1.5) Henry's Law Constant (at 25°C) is 0.000000086 $Pa \cdot m^3 \cdot mol^{-1}$. Atmospheric exposure is not anticipated.

4.4 Microbiological activity in sewage treatment systems

4.4.1 Toxicity to aquatic micro-organisms

Table 31. Activated sludge respiration inhibition

Guideline/ Test method	Test substance	Spp.	Exposure duration	Results (mg/l) measured		Remarks	Ref.
				NOEC	EC_{50}		

OECD Guideline 209, "Activated Sludge, Respiration inhibition Test"	Monosodium salt of CYA (75.6% CYA)	Activated sludge, predominantly domestic sewage	3h	2041 as CYA	3402 as CYA	Results corrected for cyanuric acid content. Test material equivalent to 75.6% by weight of cyanuric acid. Highest test concentration based on maximum limit of solubility of the test material.	Clarke N (2007)

4.4.2 PNEC for sewage treatment plant

Table 32. PNEC sewage treatment plant

	Value	**Assessment factor**	**Remarks/Justification**
PNEC stp (mg/l)	204.1	10	PNEC based on the NOEC of 2041 mg/l from the ASRI study.

4.5 Non compartment specific effects relevant for the food chain (secondary poisoning)

4.5.1 Toxicity to birds

Table 33. Toxicity to birds

Guideline/ Test method	Test substance	Species	Endpoint	Exposure duration	Results (mg/kg) measured	Ref.
					LD50	
Not stated	Monosodium cyanurate	Bobwhite quail	Mortality	8 days	>10000	Fink R (1975)
Not stated	Monosodium cyanurate	Mallard duck	Mortality	8 days	> 10000	Fink R (1975)

4.5.2 Toxicity to mammals

A study in cats was performed to characterize the toxicity potential of melamine, cyanuric acid and a combination of melamine and cyanuric acid (Puschner B et al 2007). Cyanuric acid was added to the diet of 1 cat at increasing doses of 0.2%, 0.5%, and 1% over the course of 10 days. CYA administered alone even at a high dose of 234 mg/kg did not have any effect on renal function of cats based upon normal serum creatinine and urea nitrogen concentrations. No gross or histologic abnormalities were present. There was no observed effect on renal function in one cat fed 49 - 234 mg/kg/day of CYA for a total of 10 days.

4.6 Conclusion on the environmental classification and labelling

CYA is not classified for the environment.

5 PBT AND VPVB ASSESSMENT

5.1 Assessment of PBT/vPvB properties – Comparison with the criteria of Annex XIII

5.1.1 Persistence assessment

According to Annex XIII of the REACH regulations the criteria for persistence is $T_{½}$ in fresh water sediment or $T_{½}$ in soil >120 days. In biodegradation studies with soil and sediments CYA degrades rapidly in a variety of soils attaining 52%-100% degradation in 23 days.

5.1.2 Bioaccumulation assessment

According to Annex XIII of the REACH regulations the criteria for bioaccumulation is BCF>2000. CYA has a BCF value of 6.36 and therefore there is no potential for bioaccumulation to occur.

5.1.3 Toxicity assessment

According to Annex XIII of the REACH regulations the criteria for toxicity is a NOEC<0.01 mg/l for marine or freshwater organisms or classification as carcinogenic, mutagenic or toxic for reproduction (CMR) or classification for chronic toxicity according to directive 67/548/EEC. The lowest aquatic toxicity endpoint for CYA is a NOEC of 121 mg/l in a chronic toxicity study with *Daphnia magna* (Sewell IG,Hill JWF 2007) and CYA is not classified as a CMR or for chronic toxicity.

5.1.4 Summary and overall conclusions on PBT or vPvB properties

The exposure assessment and risk characterisation only needs to be performed if the substance is identified as a PBT, vPvB or meets the criteria for classification as dangerous according to Directive 67/548/EEC or directive 1999/45/EEC.

Cyanuric acid is not PBT or vPvB and does not meet the criteria for classification as dangerous and therefore the exposure assessment and risk characterisation sections of the chemical safety report are not required.