Aquatrade Water Treatment Chemicals (Pty) Ltd

Reg No: 2015/060029/07
Vat No: 4610268676

PO Box 357
Isando
1600

4a Spanner Road
Spartan
Kempton Park

Email: admin@aquatradesa.co.za
Website: www.aquatradesa.ca.za
Tel: 011 394 8762 / Fax: 011 394 0752

## 1 Identification

### GHS Product Identifier

# SODIUM HYPOCHLORITE

### Other means of identification

| | |
|---|---|
| CAS: | 7681-52-9 |
| EC: | 231-668-3 |
| RTECS: | NH3486300 |
| ICSC: | 0482<br>1119 |
| UN: | 1791 |
| Chemical Family: | Inorganic salt |
| Synonyms: | Chlorine Bleach<br>Soda Bleach<br>Sodium Hypochlorite Solution, 12% Available Chlorine<br>Hypochlorite, Sodium<br>Sodium Hypochlorite<br>Sodium Hypochlorite (Solution) |
| Proper Shipping Name: | HYPOCHLORITE SOLUTION |
| Chemical Formula: | NaClO<br>NaOCl<br>ClNaO |

### Recommended use of the chemical and restriction on use

For general purpose cleaning, sanitizing, bleaching and for controlling bacteria, algae and fungal slimes in pool and industrial waters.

### Supplier's details

## AQUATRADE WATER TREATMENT CHEMICALS (PTY) LTD

4A Spanner Road
Spartan, Kempton Park
Gauteng, South Africa
1619
www.aquatradesa.co.za
sheq@aquatradesa.co.za

PO Box 357
Isando
Gauteng, South Africa
1600
Tel: +27 11 394 0752
Tel: +27 87 654 3326 (SDS Enquiries)

### Emergency phone number

E le Sar: +27 82 921 0643 (Available Mon - Fri, GMT 5:00 to 20:00)
Spilltech: +27 861 000 366 (Available 24/7)

## 2 Hazard(s) identification

### Classification of the substance or mixture

**Classification according to Regulation (EC) No 1272/2008**
Corrosive to Metals (Category 1), H290
Skin Corrosion/Irritant (Category 1B), H314
Acute Aquatic Toxicity (Category 1), H400
Chronic Aquatic Toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

### GHS label elements

Danger


May be corrosive to metals

Causes severe skin burns and eye damage

Very toxic to aquatic life

Toxic to aquatic life with long lasting effects

Keep only in original container.

Do not breathe dust/fume/gas/mist/vapours/spray.

Wash thoroughly after handling.

Avoid release to the environment.

Wear protective gloves/protective clothing/eye protection/face protection.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

IF ON SKIN (or hair): Remove/Take off Immediately all contaminated clothing. Rinse SKIN with water/shower.

IF INHALED: Remove victim to fresh air and Keep at rest in a position comfortable for breathing.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Immediately call a POISON CENTER or doctor/physician.

Specific treatment (see P330+P351+P353 on this label).

Wash contaminated clothing before reuse.

Absorb spillage to prevent material damage.

Collect spillage.

Store locked up.

Store in corrosive resistant container with a resistant inner liner.

Dispose of contents and container in accordance with local, regional, national, international regulations.

### Other hazards which do not result in classification

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

**Additional labelling requirements**

EUH031: Contact with acids liberates toxic gas.

## 3 Composition/information on ingredients

| Description | CAS Number | EINECS Number | % | Note |
|---|---|---|---|---|
| Sodium Hypochlorite | 7681-52-9 | 231-668-3 | 12 - 15 | |

## 4 First-aid measures

### Description of necessary first-aid measures

**Protection of first-aiders**

In case of insufficient ventilation, wear suitable respiratory equipment.

Call 112 or 10177 or your local emergency help number immediately, for emergency assistance. Call the Poison Control Center at +27 21 931 6129 – Tygerberg or +27 21 658 5308 – Red Cross, Email: poisonsinformation@uct.ac.za, Website: https://www.afritox.co.za for further instructions. Provide them with information such as the compound taken, quantity and time of ingestion, age, weight and general health status of affected individual. Carefully remove the individual from the exposure area; move them to region of fresh air immediately.

**Inhalation**
Confirm that the airways are protected; also, ensure breathing and the presence of pulse.

**Skin/Eye Contact**
If skin exposure or involvement of the eye has occurred, then wash thoroughly with copious amounts of water (for at least 15 minutes).

**Ingestion**
Unless instructed by a healthcare professional, **DO NOT** induce vomiting in the affected individual. Following an ingestion of the substance, immediately give milk to drink. In case of symptoms that indicate difficulty in swallowing including vomiting or decreased alertness, **DO NOT** give anything by way of mouth.

Take individual to emergency room (ER) for further treatment. Always try to take the compound bottle/container to the ER.

## Most important symptoms/effects, acute and delayed

Breathing difficulties, if fumes of the solution are inhaled.
Chest pain and gagging sensation; coughing.
Burning and associated pain in the mouth, throat, and food-pipe (even the stomach may be burnt).
Speaking and swallowing difficulties.
Skin irritation and burns (blister formation).
Eye irritation, burning sensation, redness and pain, if the compound spills into one's eye.
Irregular heartbeat and decrease in blood pressure (hypotension).
Stomach pain.
Shock.
Coma.

The prognosis of Sodium Hypochlorite Poisoning is dependent on the amount of substance consumed, time between consumption and treatment, severity of the symptoms, as well as general health status of the patient.

If the individual can recover from the symptoms with appropriate medication and early support, the outcome is generally good. In many cases, household products with sodium hypochlorite are only mildly toxic; severe symptoms are not reported, apart from stomach upsets.

Severe exposure of body organs (mouth, throat, gastrointestinal tract including stomach) to industrial-strength chemical can lead to complications and irreversible damage. In such cases, the outcome may be guarded.

## Indication of immediate medical attention and special treatment needed, if necessary

Medically manage symptoms, such as abnormal heart rate. Provide breathing support, if necessary. Wash skin and eyes repeatedly and thoroughly (irrigation), to eliminate any remaining hazardous compound. Following this, a suitable skin or eye ointment may be used to treat the exposure. Surgical treatment for skin burns including removal of burnt skin. Administer fluids by an intravenous drip line.

**Basic treatment**
Establish a patent airway. Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Monitor for pulmonary edema and treat if necessary. Monitor for shock and treat if necessary. Anticipate seizures and treat if necessary.

For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport. Do not use emetics.

For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Do not attempt to neutralize.

**Advanced treatment**
Consider orotracheal or nasotracheal intubation for airway control in the patient who unconscious or in respiratory arrest. Early intubation, at the first signs of upper airway obstruction, may be necessary. Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial. Monitor cardiac rhythm and treat arrhythmias if necessary. Start an IV

with D5W TKO: "To keep open", minimal flow rate. Use lactated Ringer's if signs of hypovolemia are present. Watch for signs of fluid overload. Consider drug therapy for pulmonary edema. For hypotension with signs of hypovolemia, administer fluid cautiously. consider vasopressors if hypotensive with a normal fluid volume. Watch for signs of fluid overload. Treat seizures with diazepam (Valium). Use proparacaine hydrochloride to assist eye irrigation.

## 5 Fire-fighting measures

### Suitable extinguishing media

**Suitable extinguishing media**
Water spray

**Unsuitable extinguishing media**
Dry extinguishers containing Ammonia.

### Specific hazards arising from the chemical

**Dry residue**
Contact with combustible material may cause fire. Drying the solid using heat can lead to violent exothermic decomposition

### Special protective actions for fire-fighters

**Specific methods**
In case of fire nearby, remove exposed containers. Cool containers / tanks with water spray.

**Special protective actions for fire-fighters**
Wear a self contained breathing (SCUBA) apparatus. Complete suit protecting against chemicals.

## 6 Accidental release measures

### Personal precautions, protective equipment and emergency procedures

Prohibit contact with skin and eyes and inhalation of vapours. Use personal protective equipment. Ensure adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment.

### Environmental precautions

**DO NOT** release into the environment. **DO NOT** let product enter drains. Dam up and absorb on an inert material.

### Methods and materials for containment and cleaning up

**Recovery**
Pump into a clean labelled emergency container. After cleaning, flush away traces with water. Recover water for later processing.

**Neutralisation**
Neutralize contaminated water with a sodium thiosulphate solution.

## 7 Handling and storage

### Precautions for safe handling

Liquid corrosive with suffocating vapours. Dangerous for the environment. Provide appropriate exhaust ventilation at machinery. Provide showers, eye-baths. Provide self-contained breathing apparatus nearby.

**Safe handling advice**
**Avoid** splashing when handling. Only dilute with de-ionised water (cationic resin). Provide waterproof electrical equipment.

**Hygiene measures**
Take off immediately all contaminated clothing. Prohibit contact with skin and eyes and inhalation of vapours. When using do not eat, drink or smoke. Wash hands after handling. Remove contaminated clothing and protective equipment before entering eating areas.

### Conditions for safe storage, including any incompatibilities

Keep tightly closed in a dry, cool and well-ventilated place. Use non-combustible construction materials. Store away from

moisture and heat to maintain the technical properties of the product. Protect against light. Use only clean equipment. Provide impermeable floor. Provide a catch-tank and anti-corrosion protected electrical equipment in a bunded area. Store between: 15 °C to 25 °C.

**Incompatible products**
Acids, Ammonia, Combustible material.

**Packaging material**
**Recommended**
Vulcanised or rubber coated steel, Polyethylene, Reinforced polyester.

**To be avoided**
Iron, Stainless steel, Copper and copper alloys, Aluminium, Unprotected metals.

**SANS 10263-0 Warehousing**
**8.4.3.2** Where flammable or **corrosive** substances are stored, the floor shall slope away from the storage area (primary collection area) to a secondary catch basin or sump of capacity at least 10 % of the total available storage volume of the fire section concerned. The secondary catch basin shall be within the fire section, and shall be such that it can be well ventilated. Care shall be taken in the design of such areas to prevent contamination of the soil or ground water.

**9.7.2** Every type of storage area inside a warehouse shall be clearly demarcated, for example separate storage areas for poisons, flammables and **corrosives** shall display the relevant hazard class diamond (see table 1). The dimensions of the hazard class diamonds shall be at least 250 mm x 250 mm.

**12.8.5** Storage of flammable liquids of class 3, toxic substances of division 6.1 and **corrosives** of class 8

Nitro-methane class 3, UN No. 1261, shall be separated from substances of class 6.1, and cyanides of division 6.1 shall be separated from acids of class 8. Concentrated acids and bases shall be segregated by at least 1 m. Packaged flammable liquids of class 3, toxic substances of division 6.1 and **corrosives** of class 8 that are of category 3 can be stored in the same area, provided that

a) they are kept above floor level, and
b) liquid dangerous goods of one class are not stored above dangerous goods of another class.

**12.8.8.3** Toxic and infectious substances (see class 6 in SANS 10228) can contaminate firefighting water in the event of a fire, therefore:

a) Toxic and infectious substances shall be separated from other flammable products and aerosols.
b) Toxic and infectious substances shall be segregated from oxidizing substances, organic peroxides and **corrosives**.
c) Flammable toxic and infectious substances shall be segregated from non-flammable toxic and infectious substances.

**12.8.8.4** **Corrosives** (see class 8 in SANS 10228) that leak or spill from their packaging can cause serious damage to other packages, with potentially hazardous consequences.

**Corrosives** shall be segregated from toxic substances, infectious substances, aerosols, flammables, oxidizing substances and organic peroxides.

The provisions of above apply to the storage of the following quantities of dangerous goods.

| **Corrosives (acids and bases) Class 8** | |
|---|---|
| Category 1 | > 50 kg |
| Category 2 | > 200 kg |
| Category 3 | > 1 000 kg |

## 8 Exposure controls/personal protection

### Control parameters

**Exposure Limit Values**
Products of decomposition: Chlorine

| Source | Date | Value Type | Value (ppm) | Value (mg/m³) | Remarks |
|---|---|---|---|---|---|
| INHR (FR) | 01 2008 | VLE | 0,5 | 1,5 | Regulatory binding (VRC) |
| ACGIH (US) | 2007 | TWA | 0,5 | - | - |
| ACGIH (US) | 2007 | STEL | 1 | - | - |

### Appropriate engineering controls

**Avoid** spraying the material. Supply safety shower and eyewash in immediate vicinity of exposure area. **Avoid** contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Provide sufficient air exchange and/or exhaust in work rooms to keep exposures (airborne levels of dust, fume, vapour, etc.) below recommended exposure limits.

### Individual protection measures

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

**Eye/face protection**
Face shield and safety glasses or safety goggles. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Contact lenses should not be worn; they may contribute to severe eye injury.

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

**Full contact**
Material: PVC
Minimum layer thickness: 1.2 mm

**Splash contact**
Material: PVC
Minimum layer thickness: 1.2 mm

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

## 9 Physical and chemical properties

### Physical and chemical properties

| | |
|---|---|
| Appearance: | Yellow, limpid liquid with a chlorinated odour (Tieche, A., 2007) |

| | |
|---|---|
| Melting point. | -28.9 +/- 0.5 °C (purity: 24.3 % available chlorine) (Tieche, A., 2007) |
| Boiling point: | As sodium hypochlorite solution is an aqueous mixture of an inorganic salt, water will evaporate when heating the solution. After removal of water, white crystals are observed on the bottom of the test and boiling point cannot be determined (Tieche, A., 2007). |
| Relative density: | D (21.2°C/4 °C) = 1.300 +/-0.001 |
| | (purity: 24.3 % available chlorine) (Tieche, A., 2007) |
| Granulometry | In accordance with colum 2 of REACH Annex VII, the particle size determination test (required in section 7.14) does not need to be conducted as sodium hypochlorite is marketed or used in a non solid or granular form. |
| Vapour pressure: | negligible |
| Henry's law constant: | negligible |
| Solubility in water: | Sodium hypochlorite is completely miscible in water. |
| Dissociation constant: | K = 2.9 x 10-8 (at 25 °C); pK = 7.53 (Pinto, G., 2003). |
| Partition coefficient: | The log Pow of NaOCl was calculated to be: log Pow : - 3.42 |
| n-octanol/water, log POW | The value was calculated using KOWWIN v1.67 (Anonymous, 2007). |
| Thermal stability: | Half life of a 10 % av Cl solution at different temperatures: |
| | 15 °C: 800 days; 25°C: 220 days; 60 °C: 3.5 days; |
| | 100 °C: 0.079 day |
| | and for a 5 % solution: 15 °C: 5000 days; 25°C: 790 days |
| | 60 °C: 13.5 days; 100 °C: 0.25 day. |
| | Relevant breakdown products are chlorate and chloride (White, G., 1972). |
| Auto flammability | In accordance with column 2 of REACH annex VII, the study does not need to be conducted for liquids non flammable in air. The sodium hypochlorite solution has no flash point up to 111°C, temperature at which the product starts to decompose. Thus the sodium hypochlorite solution is non flammable in air and the auto-flammability test is not required. |
| Flammability | For a liquid such as the aqueous solution of sodium hypochlorite, the primary value for ease of ignition is the flash point. No flash point was observed up to 111°C. Thus the substance is not regarded as flammable. |
| | A test on flammability in contact with water does not need to be conducted as the substance is marketed and used in aqueous solution and experience in handling and use gives no indications that the substance reacts with water. |
| | A test on pyrophoric properties does not need to be conducted as experience in handling and use gives no indications that the substance ignites or reacts with air. |
| Flash point: | No flash point was observed up to 111°C. No main test was performed. |
| | (purity: 24.3 % available chlorine) (Ferron, N., 2007) |
| Surface tension: | 82.4 mN/m +/-0.8 mN/m at 20.2-20.3°C (Ferron, N., 2007) |
| Explosive properties: | In accordance with column 2 of REACH Annex VII, explosive properties (required in section 7.11) does not need to be conducted as there are no chemical groups associated with explosive properties present in sodium hypochlorite (refer to Guidance on information requirements and chemical safety assessment, Chapter R.7a). |
| Oxidising properties: | The mean pressure rise time obtained with the mixture test item / cellulose was slower than the mean pressure rise time obtained with the mixture reference item / cellulose thus sodium hypochlorite 100 does not have oxidising properties. |
| | As testing was triggered by the presence of hypochlorite ions, the lack of oxidising propertie in sodium hypochlorite 100 indicates that solutions with a lower sodium hypochlorite concentration will not have oxidising properties. |
| Stability in organic solvents | In accordance with column 2 of REACH Annex IX, Stability in organic |

| | |
|---|---|
| and identity of relevant degradation products | solvents and identity of relevant degradation products (required in section 7.15) does not need to be conducted as Sodium hypochlorite is inorganic. |
| pH | The pH value of sodium hypochlorite solutions is alkaline. The pH value of a 5 % sodium hypochlorite solution was determined to be |
| | pH = 12.52 at 19.1 °C for the pure test item |
| | pH = 10.30 at 21.3 °C for a 1 % (m/v) solution (Ferron, 2007). |
| Viscosity | Viscosity:6.2 – 6.6 mPa.s |
| | (at 20°C ± 0.2°C) |
| | Viscosity:4.0 mPa.s |
| | for a rotation of 200 rpm (at 40°C ± 0.2°C) |
| | For lower purities of sodium hypochlorite (5 % and 14 %) also lower viscosity values were measured (Tieche, A., 2007). |
| Reactivity towards container material: | Common metals should never be used for the storage and handling of sodium hypochlorite. Suitable materials are: PVDF, PTFEE, PVC, CPVC (NF EN 901, 1999). |

**NOTE**: The physical data presented above are typical values and should not be construed as a specification.

## 10 Stability and reactivity

### Reactivity

Diminution of titration about 1.35° chlorometric per day at 17°C.

### Chemical stability

Stability of the solution decreases under the action of heat, light, and in the presence of impurities (traces of iron, nickel, copper, cobalt, aluminium, manganese).

### Possibility of hazardous reactions

Salts of hypochlorous acid, HClO. Generally toxic, irritants and powerful oxidizers, particularly in the presence of water or at higher temperature as they decompose to release oxygen and chlorine gases. On contact with urea they form the highly explosive $NCl_3$ . When heated or on contact with acids, they produce highly toxic fumes of chlorine gas [Sax, 9th ed., 1996, p. 1905]. Can react with sulfuric acid to produce heat and chlorine gas.

### Conditions to avoid

Keep at temperatures of between : 15 - 25 °C. Product is sensitive to light and moisture.

### Incompatible materials

Acids ( violent decomposition with release of chlorine), Metals ( decomposition with formation of oxygen), Combustible material.

### Hazardous decomposition products

**Thermal decomposition**
Decomposition temperature: 111 °C. Chlorine, Hypochlorous acid, Sodium chlorate

## 11 Toxicological information

### Toxicological (health) effects

**Exposure Routes**
The substance can be absorbed into the body by inhalation of its aerosol. Serious local effects by all routes of exposure.

**Inhalation**
Burning sensation. Cough. Laboured breathing. Shortness of breath. Sore throat. Symptoms may be delayed.

**Skin**
Redness. Skin burns. Pain. Blisters.

**Eye**
Redness. Pain. Severe burns.

**Ingestion**
Sore throat. Cough. Diarrhoea. Burning sensation. Abdominal pain. Vomiting. Shock or collapse. Unconsciousness.

**Acute Toxicity**

| Organism | Test Type | Route | Dose | Effect | Reference |
|---|---|---|---|---|---|
| Man | Tdlo | Intravenous | 45 mg/kg (45 mg/kg) | Lungs, thorax, or respiration: other changes; gastrointestinal: nausea or vomiting | Annals of Emergency Medicine., 21(1394), 1992 [PMID:1416339] |
| Mouse | $LD_{50}$ | Oral | 5800 mg/kg (5800 mg/kg) | Behavioral: changes in motor activity (specific assay); gastrointestinal: other changes | Shokuhin Eiseigaku Zasshi. Food Hygiene Journal., 27(553), 1986 |
| Women | Tdlo | Oral | 1 gm/kg (1000 mg/kg) | Behavioral: somnolence (general depressed activity); vascular: bp lowering not characterized in autonomic section; skin and appendages (skin): corrosive: after topical exposure | Human Toxicology., 7(37), 1988 [PMID:3346039] |

**Skin sensitisation**
No adverse effect observed (not sensitising)

**Repeated dose toxicity: via oral route - systemic**
Based on the results obtained in the repeated dose toxicity studies and taking into account the provisions laid down in Council Directive 67/548/EEC and CLP, sodium hypochlorite does not have to be classified with respect to repeated dose oral, dermal and inhalation toxicity, respectively. Also no specific target organ toxicity was detected by the available studies.

**Genetic toxicity**
Based on the results obtained in in vitro, in vivo and germ cell mutagenicity studies and taking into account the mechanism of action, the weight of evidence and the results of the carcinogenicity and reprotoxicity studies sodium hypochlorite/hypochlorous acid is not considered to be genotoxic/mutagenic or clastogenic and thus has not to be classified mutagenic according to Council Directive 67/548/EEC and CLP.

**Carcinogenicity**
Taking into account all the available information, it can be concluded that carcinogenicity is not a relevant endpoint for the oral route and is thus not classified cancerogenic according to 67/548/EEC and CLP.

**Toxicity to reproduction**
Although limited data are available in animals, the available studies are sufficient in their design and quality to draw the conclusion that there is no evidence to suggest that sodium hypochlorite would present adverse effects on development or fertility. Similarly, no such evidence is forthcoming from epidemiological studies on populations consuming chlorinated drinking water. Thus, sodium hypochlorite is not classified reprotoxic according to 67/548/EEC and CLP.

**Evidence for Carcinogenicity**
**Evaluation**
There is inadequate evidence for the carcinogenicity of hypochlorite salts in experimental animals. No data were available from studies in humans on the carcinogenicity of hypochlorite salts.

**Overall evaluation**
Hypochlorite salts are not classifiable as to their carcinogenicity to humans (Group 3).

IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT.

## Information on the likely routes of exposure

**Workers - Hazard via inhalation route**
**Systemic effects**

**Long term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 1.55 mg/m³ |
| Most sensitive endpoint: | repeated dose toxicity |

**DNEL related information**

| | |
|---|---|
| DNEL derivation method: | ECHA REACH Guidance |
| Overall assessment factor (AF): | 2 |
| Modified dose descriptor starting point: | NOAEC |
| DNEL value: | 0.5 |
| AF for dose response relationship: | 1 |
| AF for differences in duration of exposure: | 2 |
| AF for interspecies differences (allometric scaling): | 1 |
| AF for other interspecies differences: | 1 |
| Justification: | Human data |
| AF for intraspecies differences: | 1 |
| AF for the quality of the whole database: | 1 |
| AF for remaining uncertainties: | 1 |

**Acute/short term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 3.1 mg/m³ |
| Most sensitive endpoint: | repeated dose toxicity |

**DNEL related information**

| | |
|---|---|
| DNEL derivation method: | other: STEL derived by the SCOEL |
| Overall assessment factor (AF): | 1 |
| Modified dose descriptor starting point: | other: |

**Local effects**

**Long term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 1.55 mg/m³ |
| Most sensitive endpoint: | repeated dose toxicity |

**DNEL related information**

| | |
|---|---|
| DNEL derivation method: | ECHA REACH Guidance |
| Overall assessment factor (AF): | 2 |
| Dose descriptor: | NOAEC |
| AF for dose response relationship: | 1 |
| AF for differences in duration of exposure: | 2 |
| AF for interspecies differences (allometric scaling): | 1 |
| AF for other interspecies differences: | 1 |
| AF for intraspecies differences: | 1 |
| AF for the quality of the whole database: | 1 |
| AF for remaining uncertainties: | 1 |

**Acute/short term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 3.1 mg/m³ |
| Most sensitive endpoint: | repeated dose toxicity |

**DNEL related information**

| | |
|---|---|
| DNEL derivation method: | other: STEL derived by the SCOEL |
| Overall assessment factor (AF): | 1 |
| Dose descriptor starting point: | other: |

**Workers - Hazard via dermal route**

**Systemic effects**

**Long term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | no hazard identified |

**Acute/short term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | low hazard (no threshold derived) |

**DNEL related information**
**Local effects**
**Long term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 0.5 % in mixture (weight basis) |
| Most sensitive endpoint: | repeated dose toxicity |

**DNEL related information**

| | |
|---|---|
| DNEL derivation method: | other: Qualitative approach based on Human data |
| Overall assessment factor (AF): | 1 |
| Dose descriptor: | other: NOAEL |

**Acute/short term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | low hazard (no threshold derived) |

**Workers - Hazard for the eyes**
**Local effects**

| | |
|---|---|
| Hazard assessment conclusion: | low hazard (no threshold derived) |

**Additional information - workers**
**Acute /short-term DNELs (dermal)**
A DNEL for acute/short-term, dermal exposure will not be derived for the following reasons:
- The acute toxicity of corrosive substances is more related to concentration then to dose, extrapolation from data obtained with hypochlorite solutions to a fictive 100% sodium hypochlorite is not possible.

- According to chapter R8 of the ECHA “Guidance on information requirements and chemical safety assessment” a DNEL for acute toxicity should be derived if an acute toxicity hazard (leading to C&L) has been identified. Sodium Hypochlorite is not classified regarding acute
dermal toxicity.

- According to chapter R8 of the ECHA “Guidance on information requirements and chemical safety assessment” a DNEL for acute toxicity should be derived if there is a potential for high peak exposures, for instance when sampling or connecting/disconnecting vessels. This is not
the case for sodium hypochlorite. High peak exposures do not occur during the manufacturing or use.

- The risk for dermal corrosion/irritation will be evaluated qualitatively (see repeated dose toxicity).

**Acute /short-term DNELs (inhalation)**
Being an anion, ClO- will not volatilize from aqueous solutions. Thusno sodium hypochlorite as such can be present in the atmosphere except in the case in which an aerosol is formed. This does not occur during the production however workers can be exposed to chlorine atmosphere during the production of sodium hypochlorite or during the sampling or connecting/disconnecting vessels.

In Appendix R.8-13 of the Guidance on information requirements and chemical safety assessment Chapter R.8:Characterisation of dose [concentration]-response for human health (May 2008, ECHA) it is noted that:
‘When an EU IOEL exists the registrant may, under conditions as described below, use the IOEL in place of developing a DNEL. A registrant is allowed to use an IOEL as a DNEL for the same exposure route andduration, unless new scientific information that he has obtained in fulfilling his obligations under REACH doesnot support the use of the IOEL for this purpose. This could be because the information obtained is more recentthan the information that was used to support setting the IOEL at EU level and because it leads to another valuebeing derived which requires different risk management measures (RMMs) and operational conditions (OCs) ’.

The SCOEL has derived a STEL(15 min)forchlorine(SEG/SUM/76final,December1998) based on the fact that a constant exposure to 0.5 ppm (1.5 mg/m3) has been shown to be without effect in two human studies and also in rhesus monkeys whereas there is a clear evidence of irritation at 1.0 ppm (2.95 mg/m3). On this basis, the SCOEL considers that occupational exposure levels should not exceed 0.5 ppm.

The STEL derived by the SCOEL will be used as DNEL for acute inhalation exposure: 0.5 ppm of chlorinefor an exposure duration of 15 minutes. This value is equal 3.1mg/m3hypochlorite taking molecular ratio and molecular weight into account.

DNEL acute short , inhalation= 3.1 mg/m3(local and systemic effects)

**Long-term DNEL (dermal)**

Active chlorine will not pass the skin and will not be transported via the blood to become systemically available, therefore no systemic toxicity is expected after dermal exposure to hypochlorite. A qualitative approach based on local effects of hypochlorite is appropriate. For local effects after repeated dose dermal exposure a qualitative risk assessment will be performed. The study by Cotter et al. (see IUCLID5 section 7.12) provides indication that continuous exposure towards 0.5% hypochlorite concentration is about the threshold for effects on basal cell viability (Cotter, 1985). The NOAEL is 0.1 % and the LOAEL is 0.5 %, based on a 15 % decrease of basal cell viability. As this decrease is marginal, and as human case reports supports a NOAEL of 0.5 %, as specified in the EU RAR, a NOAEL for local effects after repeated dermal exposure of 0.5% is thus established. A concentration of 0.5% is equivalent to 6.8 g/L (with a density of 1.3 g/mL and a correction factor of 1.05 (74.5/71) convert the doses given in active chlorine to NaOCl).

**Long-term DNEL (inhalation)**

Because the effects appear to be related to concentration in the air and not to the duration of exposure, the SCOEL does not recommend an 8-hour TWA. However, by a conservative approach, a long termDNEL inhalation will be derivedbased on the data that is available from human volunteer studies, as follows:

- 0.5 ppm (NOEL)/1.0 ppm (LOEL) following 8-hour exposure of chlorine gas in normal subjects (Rotman et al 1983);
- 0.4 ppm (NOEL)/1.0 ppm (LOEL) following 1-hour exposure of chlorine gas in hyper-responsive subjects (D'Alessandro et al 1996 )
- 0.5 ppm (NOEL) following 3 x 6-hour exposure of chlorine gas in young health subjects (Emmen & Hoogendijk 1997 - "EuroChlor").

From this data, a NOEL of 0.5 ppm is selected and the following assessment factors will be applied as follows:
- 1 for the interspecies variation as the data are human data,
- 1 for the Intraspecies differences as a study in hyper-responsive subjects showed no significant difference in sensitivity),
- 2 for the exposure duration sincethe animal and human studies showed that there is no substantial difference in N(L)OAECs following acute, subacute and/or chronic exposure by inhalation. This is supported by the fact that the toxic effects of chlorine are considered concentration- rather dose-dependent,
- 1 for the dose-response reliability,
- 1 for the quality of whole database,

DNEL = 0.5 x 1/2 = 0.25 ppm(chlorine)

This value is equal 1.55 mg/m3 hypochlorite taking molecular ration and molecular weight into account.
DNEL long-term inhalation = 1.55 mg/m3 (local and systemic effects)

**General Population - Hazard via inhalation route**
**Systemic effects**
**Long term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 1.55 mg/m³ |
| Most sensitive endpoint: | repeated dose toxicity |

**DNEL related information**

| | |
|---|---|
| DNEL derivation method: | ECHA REACH Guidance |
| Overall assessment factor (AF): | 2 |
| Modified dose descriptor starting point: | NOAEC |
| AF for dose response relationship: | 1 |
| AF for differences in duration of exposure: | 2 |
| AF for interspecies differences (allometric scaling): | 1 |
| AF for other interspecies differences: | 1 |
| AF for intraspecies differences: | 1 |
| AF for the quality of the whole database: | 1 |
| AF for remaining uncertainties: | 1 |

**Acute/short term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 3.1 mg/m³ |

| | |
|---|---|
| Most sensitive endpoint: | repeated dose toxicity |
| **DNEL related information** | |
| Overall assessment factor (AF): | 1 |
| Modified dose descriptor starting point: | NOAEC |

**Local effects**
**Long term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 1.55 mg/m³ |
| Most sensitive endpoint: | repeated dose toxicity |
| **DNEL related information** | |
| DNEL derivation method: | ECHA REACH Guidance |
| Overall assessment factor (AF): | 2 |
| Dose descriptor: | NOAEC |
| AF for dose response relationship: | 1 |
| AF for differences in duration of exposure: | 2 |
| AF for interspecies differences (allometric scaling): | 1 |
| AF for other interspecies differences: | 1 |
| AF for intraspecies differences: | 1 |
| AF for the quality of the whole database: | 1 |
| AF for remaining uncertainties: | 1 |

**Acute/short term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 3.1 mg/m³ |
| Most sensitive endpoint: | repeated dose toxicity |
| **DNEL related information** | |
| DNEL derivation method: | other: STEL derived by the SCOEL |
| Overall assessment factor (AF): | 1 |
| Dose descriptor starting point: | other: |

**General Population - Hazard via dermal route**
**Systemic effects**
**Long term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | no hazard identified |

**Acute/short term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | low hazard (no threshold derived) |
| **DNEL related information** | |

**Local effects**
**Long term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 0.5 % in mixture (weight basis) |
| Most sensitive endpoint: | repeated dose toxicity |
| **DNEL related information** | |
| DNEL derivation method: | other: |
| Overall assessment factor (AF): | 1 |
| Dose descriptor: | other: NOAEL |

**Acute/short term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | low hazard (no threshold derived) |

**General Population - Hazard via oral route**
**Systemic effects**
**Long term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | DNEL (Derived No Effect Level) |
| Value: | 0.26 mg/kg bw/day |

**Repeated dose toxicity**

**DNEL related information**

| | |
|---|---|
| DNEL derivation method: | ECHA REACH Guidance |
| Overall assessment factor (AF): | 200 |
| Modified dose descriptor starting point: | NOAEL |
| DNEL value: | 50 |
| AF for dose response relationship: | 1 |
| AF for differences in duration of exposure: | 2 |
| AF for interspecies differences (allometric scaling): | 4 |
| AF for other interspecies differences: | 2.5 |
| AF for intraspecies differences: | 10 |
| AF for the quality of the whole database: | 1 |
| AF for remaining uncertainties: | 1 |

**Acute/short term exposure**

| | |
|---|---|
| Hazard assessment conclusion: | low hazard (no threshold derived) |

**DNEL related information**
**General Population - Hazard for the eyes**
**Local effects**

| | |
|---|---|
| Hazard assessment conclusion: | low hazard (no threshold derived) |

**Additional information - General Population**
**Acute /short-term DNELs (dermal)**
A DNEL for acute/short-term, dermal exposure will not be derived for the following reasons:
- The acute toxicity of corrosive substances is more related to concentration then to dose, extrapolation from data obtained with hypochlorite solutions to a fictive 100% sodium hypochlorite is not possible.

- According to chapter R8 of the ECHA “Guidance on information requirements and chemical safety assessment” a DNEL for acute toxicity should be derived if an acute toxicity hazard (leading to C&L) has been identified. Sodium Hypochlorite is not classified regarding acute
dermal toxicity.

- According to chapter R8 of the ECHA “Guidance on information requirements and chemical safety assessment” a DNEL for acute toxicity should be derived if there is a potential for high peak exposures, for instance when sampling or connecting/disconnecting vessels. This is not
the case for sodium hypochlorite. High peak exposures do not occur during the manufacturing or use.

- The risk for dermal corrosion/irritation will be evaluated qualitatively (see repeated dose toxicity).

**Acute /short-term DNELs (inhalation)**
Being an anion, ClO- will not volatilize from aqueous solutions. The minute fraction of HOCl present in commercial solutions has a very low volatility. Gaseous chlorine can be released from a sodium hypochlorite solution only in accidental case by mixing with strong acids. Therefore, exposure does not comprise inhalation exposure, except in the case in which an aerosol is formed as for the trigger sray bottles for household cleaners.

The SCOEL has derived a STEL(15 min) for chlorine(SEG/SUM/76final,December1998) based on the fact that a constant exposure to 0.5 ppm (1.5 mg/m3) has been shown to be without effect in two human studies and also in rhesus monkeys whereas there is a clear evidence of irritation at 1.0 ppm (2.95 mg/m3). On this basis, the SCOEL considers that occupational exposure levels should not exceed 0.5 ppm.

The STEL derived by the SCOEL will be used as DNEL for acute inhalation exposure: 0.5 ppm of chlorinefor an exposure duration of 15 minutes.This value is equal 3.1mg/m3hypochlorite taking molecular ratio and molecular weight into account.

DNEL acute short , inhalation= 3.1 mg/m3(local and systemic effects)

**Acute /short-term DNELs (oral)**
A DNEL for acute/short-term, oral exposure will not be derived for the following reasons:
- Effects of accidental ingestion of domestic sodium hypochlorite bleaches (strongly diluted hypochlorite solutions only)

are not expected to lead to severe or permanent damage of the gastrointestinal tract as recovery is rapid and without any permanent health consequences,
based on human data.

- The acute toxicity of corrosive substances is more related to concentration then to dose, extrapolation from data obtained with hypochlorite solutions to a fictive 100% sodium hypochlorite is not possible.

- According to chapter R8 of the ECHA “Guidance on information requirements and chemical safety assessment” a DNEL for acute toxicity should be derived if an acute toxicity hazard (leading to C&L) has been identified. Theoretical pure sodium hypochlorite should be
classified as “harmful for ingestion” (Xn, R22) on the basis of the oral LD50 data. However, the effects noted can be considered of secondary nature and caused by local tissue damage due the substance corrosive properties. This classification does not apply to solutions as
their concentration is always below 25%. The acute toxicity of corrosive substances is more related to concentration then to dose, and extrapolation from data obtained from using a hypochlorite solution to a fictive 100% sodium hypochlorite is not possible.

As the highest concentrations of hypochlorite solutions industrially produced and marketed are about 15%, and solutions marketed for consumer use are typically 5% or less, it can be concluded from the data presented that hypochlorite solutions are of low acute oral toxicity.
This is confirmed by the available data from human accidents, where the few deaths that have occurred after hypochlorite ingestion are mostly attributable to aspiration pneumonia.

- According to chapter R8 of the ECHA “Guidance on information requirements and chemical safety assessment” a DNEL for acute toxicity should be derived if there is a potential for high peak exposures. This is not the case during the use of sodium hypochlorite.

**Long-term DNEL (oral)**
The study by Hasegawa (1986) was chosen as key study for the derivation of the DNEL, although usually a value from a chronic study is preferred over a value from a sub-chronic study. In the Hasegawa study the dosing levels include “no-effect” and “effect” levels. Thus, a
NO(A)EL and a LO(A)EL could be distinguished. In the NTP study (1992) as in all other studies, dose levels were maximum levels, the highest dose level is a NO(A)EL and there was no LOAEL. Basically, when selecting a NOAEL for risk assessment. One should base it on the highest NOAEL which lower then the lowest LOAEL level (which incorporates in its evaluation all relevant – i.e. most sensitive - parameters).

The NOELlong-term, oral, determined in the Hasegawa study (rat, 90 day drinking water study) was 50 mg/kg bw/day (see section 5.6.1.1). An assessment factor of 4 for the interspecies variation (allometric scaling from rat to human), an additional 2.5 factor for other interspecies
differences, a factor of 2 for extrapolation from subchronic to chronic exposure plus a factor of 10 for intraspecies differences (general population) was applied resulting in a final assessment factor of 200. In addition a correction factor of 1.05 (74.5/71) has to be applied to convert the doses given in active chlorine to NaOCl.

DNEL long-term, oral = 0.26 mg/kg bw/day.

**Long-term DNEL (dermal)**
Active chlorine will not pass the skin and will not be transported via the blood to become systemically available, therefore no systemic toxicity is expected after dermal exposure to hypochlorite. A qualitative approach based on local effects of hypochlorite is appropriate.

For local effects after repeated dose dermal exposure a qualitative risk assessment will be performed. The study by Cotter et al. (see IUCLID5 section 7.12) provides indication that continuous exposure towards 0.5% hypochlorite concentration is about the threshold for effects on basal cell viability (Cotter, 1985). The NOAEL is 0.1 % and the LOAEL is 0.5 %, based on a 15 % decrease of basal cell viability. As this decrease is marginal, and as human case reports supports a NOAEL of 0.5 %, as specified in the EU RAR, a NOAEL for local effects after repeated dermal exposure of 0.5% is thus established. A concentration of 0.5% is equivalent to 6.8 g/L (with a density of 1.3 g/mL and a correction factor of 1.05 (74.5/71) convert the doses given in active chlorine to NaOCl).

**Long-term DNEL (inhalation)**

Because the effects appear to be related to concentration in the air and not to the duration of exposure, the SCOEL does not recommend an 8-hour TWA. However, by a conservative approach, a long termDNEL inhalation will be derivedbased on the data that is available from human volunteer studies, as follows:
- 0.5 ppm (NOEL)/1.0 ppm (LOEL) following 8-hour exposure of chlorine gas in normal subjects (Rotman et al 1983);
- 0.4 ppm (NOEL)/1.0 ppm (LOEL) following 1-hour exposure of chlorine gas in hyper-responsive subjects (D'Alessandro et al 1996 )
- 0.5 ppm (NOEL) following 3 x 6-hour exposure of chlorine gas in young health subjects (Emmen & Hoogendijk 1997 - "EuroChlor").

From this data, a NOEL of 0.5 ppm is selected and the following assessment factors will be applied as follows:
- 1 for the interspecies variation as the data are human data,
- 1 for the Intraspecies differences as a study in hyper-responsive subjects showed no significant difference in sensitivity,
- 2 for the exposure duration sincethe animal and human studies showed that there is no substantial difference in N(L)OAECs following acute, subacute and/or chronic exposure by inhalation. This is supported by the fact that the toxic effects of chlorine are considered concentration- rather dose-dependent,
- 1 for the dose-response reliability,
- 1 for the quality of whole database,
DNEL = 0.5 x 1/2 = 0.25 ppm (chlorine)

This value is equal 1.55 mg/m3 hypochlorite taking molecular ration and molecular weight into account.
DNEL long-term inhalation = 1.55 mg/m3 (local and systemic effects

**Symptoms related to the physical, chemical and toxicological characteristics**

1. Pain & inflammation of mouth, pharynx, esophagus, & stomach. Erosion of mucous membranes, chiefly of stomach.
2. Vomiting, Hemorrhage
3. Circulatory collapse, with cold & clammy skin, cyanosis, & shallow respirations.
4. Confusion, delirium, coma.
5. Edema of pharynx, glottis & larynx, with stridor & obstruction.
6. Perforation of esophagus or stomach, with mediastinitis or peritonitis.
7. Inhalation of hypochlorous acid fumes causes severe resp tract irritation & pulmonary edema.
8. Skin contact may cause vesicular eruptions and eczematoid dermatitis.

Ingestion of lethal dose of sodium hypochlorite had corrosive effect & methemoglobinemia was present.

An 18 month old girl who swallowed a "few tablespoons" of liquid household bleach and immediately coughed, choked and vomited. Gastric lavage with a weak vinegar solution was performed within 10 min. Promptly thereafter she became lethargic and was admitted to a local hospital in a state of coma. Her temp was 103.2 deg F, pulse 160, respirations 88, and blood pressure unobtainable. Rales and rhonchi were audible, & clonic convulsive movements persisted until death, which occurred, in spite of vigorous treatment, 19 hr after ingestion. Postmortem exam revealed focal necrosis, hemorrhage, and superficial erosion of the gastric mucosa, but the presumptive cause of death was an acute tracheobronchitis, & obstructive atelectasis secondary to bronchial exudates.

A 61 yr old woman was completing a hemodialysis treatment when routine cleaning of the hemodialysis machine was started. Approx 2 l of undiluted sodium hypochlorite cleaning solution was added to the dialysis bath. For less than 2 min the chlorox soaked membrane was in contact with the blood returning to the pt. This led to massive hemolysis, hyperkalemia, cyanosis, & cardiopulmonary arrest.

Exposure to drain and sanitary cleansing vapors containing sodium hypochlorite and sodium hydroxide provoked acute, reversible toxic alopecia. Trichograms of this depilatory type of alopecia showed signs of hair dystrophy and loss of the hair sheath. Histological exam of skin and hair showed changes in hair structures and discrete lymphocytic infiltration. The prerequisite for this effect was the improper use of cleansing agents and the relative conditions during use which led to the intense exposure of the scalp to sodium hypochlorite vapor.

The cytotoxicity of 7 solution, one being sodium hypochlorite, used in root canal therapy was tested in human fibroblast and lymphoblast cultures. The amount of cell damage was assessed by measuring the release of (51)chromium from labeled cells into the medium. The solution when applied at therapeutic concn, displayed high toxicity in vitro and differences in cytotoxicity were seen between different solution. Generally, lymphoblasts were found to be more sensitive than fibroblasts.

Ingestion causes irritation and corrosion of mucous membranes with pain and vomiting. A fall in blood pressure, delirium, and coma may occur. Inhalation of hypochlorous fumes causes coughing and choking and may cause severe respiratory tract irritation and pulmonary edema.

An 18 yr old attendant developed onycholysis of all her fingernails after adding 16% sodium hypochlorite solution to swimming pool water daily for several weeks. The nails grew normally when she ceased using the preparation. Onycholysis developed the following year when she again used the hypochlorite solution.

A young girl had suffered episodes of vomiting, abdominal pain, and bronchopneumonia over a period of a year, which were finally traced to her habit of sucking socks bleached with sodium hypochlorite.

**Non-Human Toxicity Excerpts**

In tests on rabbit eyes, 5% solution which had ph 11.1 to 11.6 caused immediate pain, but if washed off with water within thirty seconds, left only slight transient corneal epithelial haze & conjunctival edema, with return to normal within a day or less. Interesting difference between rabbit & monkey eyes in response to exposure to 5.5% solution has been reported. Indicating that monkey eye recovers much more rapidly, maybe more like human. 1 drop of 15% solution @ ph 11.2 caused immediate severe pain. Caused hemorrhages from conjunctiva and nose, plus rapid onset of groundglass appearance of corneal epithelium. Followed by moderate bluish edema of whole cornea, chemosis. Neovascularization of conjunctiva scarring of nictitating membrane.

Undiluted liquid bleach (clorox) instilled into upper esophagus of rabbits & dogs produced no permanent esophageal lesions unless lower end of esophagus was occluded, in which case half of dogs died from esophageal perforation, mediastinitis & pleurisy.

Sodium hypochlorite was among compounds screened & found positive on activation in system with rat liver microsome fraction & s9 mixture applied to chromosomal aberration tests in vitro.

Discharges in nw sicily were studied. Safety limit of 0.1 ppm for sodium hypochlorite was determined. At 0.02 ppm residual chlorine, there was 50% inhibition of phytoplankton growth.

Embryos of the tidewater silverside were subjected to a 28 day toxicity test with chlorine produced (supplied as sodium hypochloride) oxidants which began with stage 21 & 22 embryos (approx 36 hr old). Average measured chlorine produced oxidant concentration in exposure water were non-detectable (less than 0.01 mg/l) in the control and in the 2 lowest exposure concentration, & 0.01, 0.04, & 0.21 mg/l. Survival of embryos to hatching averaged 99% with no significant differences among treatments.

Rats were treated with 50 mg of chlorine solution (sodium hypochlorite) by intragastric intubation & sacrificed at 3 hr, 24 hr, & 7 days interval after chlorine administration. The hypothalamus norepinephrine content was much lower @ 3 hr & 24 hr after treatment & recovered after 7 days. The effect on norepinephrine content may be due to a change at the synaptic membrane site through the action of chlorinated hydrocarbons produced as a result of chlorine treatment.

Groups of male or female rats were given sodium hypochlorite in their drinking water, at concentration of 0.1 and 0.5% males and 0.2 and 0.1% for females, for 104 wk. All surviving rats were killed at wk 112 (after 8 wk on untreated tap water). Rats of both sexes given the chemical showed a reduction in body wt gain, but hematological and biochemical examination of the blood showed no changes due to treatment, and no significant lesions attributable to the treatment were detected in any tissue in the histopathological investigation. Although a variety of tumors developed in all groups, no dose related change in either the incidence or latent period of tumors was observed for any organ or tissue in either sex.

Male Sprague-Dawley rats were exposed to chlorine based disinfectants in the drinking water from weaning to 12 weeks of age, at which time they were terminated and assessed for immune competence. Chlorine based drinking water disinfectants used were sodium hypochlorite (5, 15 and 30 ppm) and monochloramine (9, 19 and 38 ppm). Parameters of immunity measured were spleen and thymus weights, antibody production, delayed type hypersensitivity reactions, natural killer cell cytotoxicity, oxidative metabolism response (ie chemiluminescence - CL) and phagocytosis by macrophages, and production of 2 immunoregulatory cytokines, interleukin 2 and prostaglandin E2. Significant ($p < 0.05$) reductions of spleen weight. Delayed type hypersensitivity reactions, and oxidative metabolism by macrophages were observed only in groups of rats exposed to high levels (30 ppm) of sodium hypochlorite while prostaglandin E2 production was elevated. Rats exposed to the higher doses of monochloramine had reduced spleen weights (38 ppm), decreased antibody synthesis (9 and 19 ppm) and augmented prostaglandin E2 production (19 and 38 ppm).

Although sodium hypochlorite (10% commercial bleach) provided good short term control of algae, regrowth occurred within 3 days. Sodium hypochlorite was very toxic when applied directly to leaves of 8 species of foliage plants causing severe necrosis, chlorosis and leaf abscission following a single application.

The chemical parameters, antimicrobial activity, and tissue toxicity of two sodium hypochlorite solution buffered to a physiol ph were studied. Initially, a 0.5% sodium hypochlorite solution buffered with 3 g of sodium phosphate, monobasic /l was examined. The solution had a ph of 7.49 and an osmolality of 352 mosmol/l. When compared with unbuffered and sodium bicarbonate (nahco3) buffered 0.5% sodium hypochlorite solution, the sodium phosphate, monobasic (nah2po4) buffered solution was significantly more effective in killing Staphylococcus aureus in vitro. However, the ph of the sodium phosphate, monobasic (nah2po4) buffered solution decreased over time with a concomitant decrease in antibacterial activity. A freshly prepd solution decontaminated human cadaver skin colonized by Stapylococcus aureus, Pseudomonas aeruginasa, or Candida albicans in vitro within 10 min of exposure, whereas a 24 hr old solution cleared the skin of organisms within 15 min. When gauze soaked with 0.5% sodium hypochlorite was applied to guinea pig skin for 2 wk, a 15% decrease in basal cell viabilities was noted. Because of the ph instability and basal cell toxicity, a 0.1% sodium hypochlorite solution buffered with sodium phosphate, monobasic (nah2po4) was evaluated. This solution had an osmolality of 386 mosmol/l and a ph of 7.4 that was stable over 1 wk. A freshly prepared 0.1% sodium hypochlorite solution decontaminated skin colonized with Staphylococcus aureus, Candida albicans, and Pseudomonas aeruginosa within 10, 20, and 30 min, respectively. A 24 hr old solution did not completely decontaminate the colonized skin but significantly reduced the number of microorganisms on the skin surface.

There was no observed increase in tumor incidence among male and female B6CF1 mice given 500 or 1000 mg/l sodium hypochlorite in drinking water for 103 weeks.

Groups of 50 male and 50n female Fischer 344 rats were given 0, 500, or 1,000 mg/l (males) or 0, 1,000, or 2,000 mg/L (females) sodium hypochlorite in drinking water for 104 weeks. No increase in tumor incidence was seen in treated animals compared with controls.

### Delayed and immediate effects and also chronic effects from short and long term exposure

Refer section "Symptoms related to the ..." for effects.

### Numerical measures of toxicity (such as acute toxicity estimates)

**Data for WORKERS**

| **INHALATION Exposure** | **Threshold** | **Most sensitive study** |
|---|---|---|
| **Systemic Effects** | | |
| Long-term: | (DNEL) 1.55 mg/m³ | repeated dose toxicity |
| Acute /short term: | (DNEL) 3.1 mg/m³ | repeated dose toxicity |
| **Local Effects** | | |
| Long-term: | (DNEL) 1.55 mg/m³ | repeated dose toxicity |
| Acute /short term: | (DNEL) 3.1 mg/m³ | repeated dose toxicity |
| **DERMAL Exposure** | **Threshold** | **Most sensitive study** |
| **Systemic Effects** | | |
| Long-term: | No hazard identified | |
| Acute /short term: | Low hazard (no threshold derived) | |
| **Local Effects** | | |
| Long-term: | | |
| Acute /short term: | Low hazard (no threshold derived) | |

**EYE Exposure**

Low hazard (no threshold derived)

**Data for the GENERAL POPULATION**

| **INHALATION Exposure** | **Threshold** | **Most sensitive study** |
|---|---|---|
| **Systemic Effects** | | |
| Long-term: | (DNEL) 1.55 mg/m³ | repeated dose toxicity |
| Acute /short term: | (DNEL) 3.1 mg/m³ | repeated dose toxicity |
| **Local Effects** | | |
| Long-term: | (DNEL) 1.55 mg/m³ | repeated dose toxicity |
| Acute /short term: | (DNEL) 3.1 mg/m³ | repeated dose toxicity |
| **DERMAL Exposure** | **Threshold** | **Most sensitive study** |
| **Systemic Effects** | | |

Long-term: No hazard identified
Acute /short term: Low hazard (no threshold derived)

**Local Effects**

Long-term: - -
Acute /short term: Low hazard (no threshold derived)

| **ORAL Exposure Threshold** | | **Most sensitive study** |
|---|---|---|
| **Systemic Effects** | | |
| Long-term: | (DNEL) 260 µg/kg bw/day | repeated dose toxicity |
| Acute /short term: | Low hazard (no threshold derived) | |

**EYE Exposure**

Low hazard (no threshold derived)

**Acute Toxicity**

**Oral**

| | |
|---|---|
| $LD_{50}$ | 1 100 mg/kg bw (rat) |
| $LD_0$ | 626 mg/kg bw (rat) |

**Dermal**

| | |
|---|---|
| $LD_{50}$ | 20 000 mg/kg bw (rabbit) |
| $LD_0$ | 14 420 mg/kg bw (rabbit) |

**Repeated dose toxicity**

| | | |
|---|---|---|
| NOAEL | (rat): | 16.7 - 57.2 mg/kg bw/day |
| NOAEL | (mouse): | 34.4 mg/kg bw/day |
| LOAEL | (rat): | 16.7 - 114.4 mg/kg bw/day |
| LOAEL | (mouse): | 34.4 mg/kg bw/day |

**Non-Human Toxicity Values**

| | | | |
|---|---|---|---|
| $LD_{50}$ | Rat | oral | 8.91 g/kg |
| $LD_{50}$ | Mouse | oral | 5 800 mg/kg |

**Acute toxicity: via oral route**

$LD_{50}$ 1 100 mg/kg bw

**Acute toxicity: via inhalation route**

$LC_{50}$ 10 500 mg/m³

**Acute toxicity: via dermal route**

$LD_{50}$ 20 000 mg/kg bw

### Interactive effects

Pulmonary edema can occur from chlorine vapors developing after mixing clorox, a 5.25% soln of sodium hypochlorite, and Saniflush (80% NaHSO4).

### Where specific chemical data are not available

No additional data.

### Mixtures

No additional data.

### Mixture versus ingredient information

No additional data.

### Other information

No additional data.

## 12 Ecological information

### Toxicity

**Phototransformation in air**

| | |
|---|---|
| Dissipation half-life ($DT_{50}$) | 3.82 months |

**Phototransformation in water**

| | |
|---|---|
| Dissipation half-life ($DT_{50}$) | 12 - 60 min |

**Henrys law constant (H)**

H - dimensionless
0.076 @ 20 °C and 100 kPa

**Hazard for Aquatic Organisms**

| | |
|---|---|
| Freshwater | 210 ng/L |
| Intermittent releases (freshwater) | 260 ng/L |
| Marine water | 42 ng/L |
| Intermittent releases (marine water) | - |
| Sewage treatment plant (STP) | 4.69 mg/L |
| Sediment (freshwater) | No exposure of sediment expected |
| Sediment (marine water) | No exposure of sediment expected |

**Hazard for Air**

| | |
|---|---|
| Air | No hazard identified |

**Hazard for Terrestrial Organism**

| | |
|---|---|
| Soil | No exposure of soil expected |

**Hazard for Predators**

| | |
|---|---|
| Secondary poisoning | 11.1 mg/kg food |

**Short–term toxicity to fish**

| | |
|---|---|
| $LC_{50}$ (5 days) | 50 µg/L |

**Short–term toxicity to aquatic invertebrates**

| | |
|---|---|
| $EC_{50}$ (48 h) | 26 - 141 µg/L |
| $LC_{50}$ (72 h) | 90 - 180 µg/L |
| $LC_{50}$ (48 h) | 29 - 260 µg/L |
| $LC_{50}$ (24 h) | 70 - 55 000 µg/L |
| NOEC (48 h) | 25 - 50 µg/L |

**Toxicity to aquatic algae and cyanobacteria**

| | |
|---|---|
| $EC_{50}$ (72 h) | 18.3 - 36.5 µg/L |
| NOEC (72 h) | 5.4 µg/L |
| LOEC (72 h) | 5.4 - 23.3 µg/L |
| $EC_{10}$ (72 h) | 6.2 - 19.9 µg/L |
| $EC_{20}$ (72 h) | 9 - 24.5 µg/L |

**Toxicity to aquatic plants other than algae**

| | |
|---|---|
| $EC_{50}$ (4 days) | 100 - 400 µg/L |
| NOEC (4 days) | 20 - 50 µg/L |

**Toxicity to microorganisms**

| | |
|---|---|
| EC50 (3 h) | 3 - 563 mg/L |
| NOEC (3 h) | 41.1 - 300 mg/L |
| EC10 (3 h) | 46.9 - 342 mg/L |

**Toxicity to birds**

| | |
|---|---|
| NOEC (70 days) | 200 mg/L drinking water |
| LOEC (70 days) | 400 mg/L drinking water |

## Persistence and degradability

Inorganic substances cannot be tested for (ready) biodegradability. This is acknowledged in column 2 of REACH regulation

Annex VII: “9.2.1.1. The study does not need to be conducted if the substance is inorganic”.

## Bioaccumulative potential

This substance reacts instantly with organic matter and every oxidizable material. Therefore no bioaccumulation testing according to Annex IX, 9.3.2. is technically feasible. In addition, according to the hypothesised logKow = -3.42 no bioaccumulation is expected.

## Mobility in soil

### Distribution

The following processes are involved in the distribution of hypochlorite in the environment.
• Fraction of substance in air associated with aerosol
• Partitioning between air and water
• Partitioning between solids and water in soil, sediment and suspended matter.

### Adsorption to aerosol particles

The fraction of substance associated with aerosol particles can be estimated on the basis of the vapour pressure of the substance
Fassaer = CONjunge x SURFaer / VP + CONjunge x SURFaer
Fassaer = fraction of the substance associated with aerosol particles
CONjunge = constant of Junge equation [Pa x m]
SURFaer = surface area of aerosol particles [m2 x m3] According to TGD as a default the product of CONjunge x SURFaer is set to10-4 Pa.
VP = Vapour pressure of hypochlorous acid [Pa] = 2500
This results in Fassaer = 4.0 x 10-7.
Thus, most atmospheric hypochlorous acid is not associated with atmospheric aerosols.

### Volatilisation from water

At environmental pH values (6.5-8.5) half of the hypochlorite is in the undissociated form of hypochlorous acid and half is dissociated to the hypochlorite anion. Only the hypochlorous acid fraction is volatile. The measured Henry’s Law constant for hypochlorous acid of 0.097 Pa $m^3$ mol-1 indicates that volatilisation from surface water is not expected to be an important process.

### Adsorption onto / desorption from soils

As hypochlorite is a very strong oxidising substance, an adsorption/desorption test is technically not feasible. Hypochlorite would react with organic substance present in the test system and degrades to chloride within minutes. The adsorption coefficient Koc can only be calculated applying QSAR:
An hypothetical Koc can be calculated from Kow through different linear regression equations reported un Guidance (R.7.1.15.3). It can also be calculated by KOCWIN that delivers 2 figures
- using Molecular Connectivity Indices: log Koc = 1.12 (Koc = 13.22 L/kg)
- using regression equation: logKoc = 0.8679 logKow - 0.0004 = -2.9686 (Koc = 0.001075 L/kg)
Hypochlorite as an inorganic substance with an infinite water solubility and very low partitioning coefficients should be considered to be mobile in soil and sediment.

### Summary of environmental distribution

The adsorption of hypochlorous acid to aerosol particles, the volatilisation from water into air and the adsorption of hypochlorite onto soil are very low. Thus, hypochlorite remains in the aqueous phase where it degrades very rapidly to chloride.

## Other adverse effects

### Stability

In concentrated sodium hypochlorite solutions, the content of available chlorine decreases because NaClO tends to disproportionate to chloride and chlorate ions:
The reaction is:
3 NaClO => 2 NaCl + NaClO3 Keq = 1027

It is the resultant of two reactions: a slow one with formation of chlorite and a fast one with formation of chlorate by reaction between chlorite and hypochlorite.
2 NaClO => NaClO2 + NaCl (slow reaction)
NaClO + NaClO2 => NaClO3 + NaCl (fast reaction)

The first reaction (that produces chlorite) controls the reaction rate producing chlorate. The formation rate of chlorate, at room temperature and pH = 11, is very slow.The process is dependant on the time, temperature, impurities, pH and concentration of the sodium hypochlorite solution. Also light can decompose hypochlorite solutions.

**Time Dependence**
At constant temperature the inverse of the active product concentration is a linear function of the time. A solution dosed at 150 g/l available chlorine which is kept away from sunlight and at constant 15°C, loses 1/6 of its concentration within less than 3 months. In diluted hypochlorite solutions the losses are minor.

**pH Dependence**
Hypochlorite should not be added to a unbuffered medium, because at low pH, the following secondary reactions could occur:
In acid media under pH 4 hypochlorite will be transformed to gaseous chlorine.
$HOCl + H+ + Cl- \Rightarrow Cl2 + H2O$

Between pH 4 and 11, both ClO- and HOCl are present with the latter being much more active. This pH will be obtained when all the sodium hydroxide present in the hypochlorite solution has been carbonated (see chapter 1.2). Degradation of HOCl is more rapid than the degradation of ClO-.
if pH <6, the main reaction is: $2HClO \Rightarrow 2HCl + O2$
if pH >6, the main reaction is: $3\ NaClO \Rightarrow NaClO3 + 2\ NaCl$

Hypochlorous acid (HClO) is very unstable and it suddenly decomposes with formation of oxygen:
$2\ HOCl \Rightarrow 2\ HCl + O2$

**Dependence upon Impurities**
Sodium hypochlorite can decompose to oxygen according to the following reaction:
$2\ NaClO \Rightarrow 2\ NaCl + O2$

The decomposition reaction is a bimolecular one and requires an activation energy of 113.3 kJ/mol (26.6 kcal/mol). Although it is slower than the chlorate formation reaction, it is catalysed by trace amounts of metallic impurities.

The strongest decomposition catalysts to oxygen are: Co, Ni and Cu; whereas Fe and Mn are weaker catalysts. To avoid decomposition of commercial hypochlorite solutions, these metals must be reduced as much as possible. Generally, their elimination occurs mechanically by filtering as their solubility is reduced during the hypochlorite production step.

Salts such as sodium chloride, sodium carbonate and sodium chlorate have only a very low influence on reaction rate within the range of concentration where they are normally present. Their influence on reaction rate is only remarkable in some particular cases (e.g. diluted High Grade Sodium Hypochlorite where NaCl content is highly reduced because of the specific production process).

Sodium hydroxide does not influence the reaction rate if its concentration is greater than 10-3 M (0.04 g/l).

**Light Dependence**
The sodium hypochlorite solution is very sensitive to light. Direct sunlight may cause rearrangement and decomposition resulting in the formation of chlorateand oxygen. The presence of isocyanuric acid in solution reduces this sensitivity to a great extent.

**Temperature Dependence**
The influence of temperature is very high: the decomposition rate doubles if the temperature increases by ~ 5.5°C. If temperature is more than 35°C, the decomposition reactions are very rapid:
$3NaClO \Rightarrow NaClO3 + 2NaCl$

In every case, the temperature of the solution must be below 55°C in order to prevent a sudden decomposition of the hypochlorite.
The more stable solutions are those of low hypochlorite concentration, with a pH of 11 and low iron, copper, and nickel content, stored in the dark at low temperature.

**Photolysis in water**
The photolysis half-life of aqueous chlorine in, exposed to summer noon sunlit with clear sky (47°N) at a pH 8 is 12 min

when measured at the surface. The half-life increases with decreasing pH due to the decreasing ratio of OCl-/HOCl to 60 min at pH 5. The pseudo-first-order rate constant for the photolysis of HOCl becomes 2 x 10-4s-1and that of OCl-1.2 x 10-3s-1The variation of the rate of photolysis with depth was calculated for water columns exhibiting different light absorption coefficients by taking into account that, for both HOCl and OCl-, the most effective wavelength for photolysis in sunlight is approx. 330 nm. These results show that in water treatment, chlorine photolysis should be minimized whenever possible by operating at low pH, sun shielding or night-time addition of chlorine or avoiding storage in shallow reservoirs. The rate of chlorine photolysis controls the formation of OH radical which acts as a secondary highly reactive photooxidant.

On UV (255 nm) irradiation both HOCl and OCl- photolyze at comparable rates and slowly enough that chlorine depletion will not occur during the time of irradiation typical in UV disinfection.

Photolysis can also contribute to the depletion of chlorine in atmospheric waters whenever chlorine is formed by (slow) ozonation of chloride.

## 13 Disposal considerations

### Disposal methods

**Waste disposal recommendations**
Dispose of waste and container in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle/reuse. Remove for physico-chemical/biological treatment. **DO NOT** discharge into drains or the environment.

The generation of waste should be avoided or minimized wherever possible. Sodium hypochlorite rapidly breaks down to salt, water, and oxygen when used as directed. Its residue is safe for septic systems. Sodium hypochlorite may be neutralized with sodium bisulphite, sodium sulphite or dilute hydrogen peroxide.

**Ecology - waste materials**
**DO NOT** release to the environment.

**Empty Container**
Container can be reused. Rinse thoroughly or neutralise as per waste recommendations before use, return to supplier or discard in chemical waste. Recover waste water for processing later.

**Disposal of product**
Dilute with water. Neutralize contaminated water with a sodium thiosulphate solution. Recover waste water for processing later.

## 14 Transport information

### UN Number

**Land transport (ADR/RID)**

| | |
|---|---|
| UN number: | 1791 |
| Proper shipping name and description: | Hypochlorite solution |
| Chemical name: | Hypochlorite solution |
| Class: | 8 |
| Classification code: | C9 |
| Packaging group: | II |
| Labels: | 8 |
| ERG: | 154 |
| SpecialProvisions: | The container is fitted with a vented cap.<br>Ensure it remain upright at all times.<br>DO NOT double stack! |

**Inland waterway transport (ADN(R))**

| | |
|---|---|
| UN number: | 1791 |

| | |
|---|---|
| Proper shipping name and description: | Hypochlorite solution |
| Chemical name: | Hypochlorite solution |
| Class: | 8 |
| Classification code: | C9 |
| Packaging group: | II |
| Labels: | 8 |

**Marine transport (IMDG)**

| | |
|---|---|
| UN number: | 1791 |
| Proper shipping name and description: | Hypochlorite solution |
| Chemical name: | Hypochlorite solution |
| Class: | 8 |
| Packaging group: | II |
| EmS code: | F-A, S-B |
| Labels: | 8 |
| Marine pollutant | |

**Air transport ICAO/IATA**

| | |
|---|---|
| UN number: | 1791 |
| Proper shipping name and description: | Hypochlorite solution |
| Chemical name: | Hypochlorite solution |
| Class: | 8 |
| Packaging group: | II |
| Labels: | 8 |

**Additional transport information**

Special provision : A3

Hypochlorite >16%

| | | | |
|---|---|---|---|
| Passanger Aircraft instruction : | 809 | Ltd quantity max Qty/Pkg : | 1 l |
| Cargo Aircarft instruction : | 813 | Ltd quantity max Qty/Pkg : | 30 l |

Hypochlorite <16%

| | | | |
|---|---|---|---|
| Passanger Aircraft instruction : | 819 | Ltd quantity max Qty/Pkg : | 5 l |
| Cargo Aircarft instruction : | 821 | Ltd quantity max Qty/Pkg : | 60 l |

## UN Proper Shipping Name

HYPOCHLORITE SOLUTION

## Transport hazard class(es)

8

## Packing group, if applicable

III **Exempt Quantity** 50Kg **Factor** 20

## Environmental hazards

Acute Aquatic Toxicity, Category 1. **DO NOT** allow product to enter open water sources, municipal drains or stormwater systems.

## Special precautions for user

**DO NOT** load with Classes 1 and 2.3.
Cyanides **must not** be transported with acid.
Can be loaded with Class 8B. Concentrated acids and bases **must** be kept at least 1 metre apart.
Can be loaded with Classes 2.1, 2.2, 5.2, 6.1 and 6.2 if kept 1 metre apart.
Can be loaded with all other classes.
Goods of different classes **must** be segregated by an air space of at least 100mm or by an approved segregation device or non-dangerous goods.

**P, B, L and O provisions as per SANS 10231:2006**
None.

### Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable.

## 15 Regulatory information

### Safety, health and environmental regulations specific for the product in question

**SA NATIONAL LEGISLATION**
Hazardous Substances Act 15 of 1973 and Regulations.
Occupational Health and Safety Act 85 of 1993 and Regulations.

**SA NATIONAL STANDARDS**
SANS 10228 : 2006 : Identification and Classification of Dangerous Goods for Transport by Road and Rail.
SANS 10231 : 2018 : Transport of dangerous goods - Operational requirements for road vehicles.
SANS 10234 : 2008 : Globally Harmonized System of classification and labelling of chemicals (GHS).
SANS 11014 : 2010 : Safety Data Sheets for chemical Products.

**Regulation (EU)2017/1273**
Substance Active chlorine released from sodium hypochlorite received following approval.
1 - Human hygiene
2 - Disinfectants and algaecides not intended for direct application to humans or animals
3 - Veterinary hygiene
4 - Food and feed area
5 - Drinking water

**Seveso III: Directive 2012/18/EU repealing Directive 96/82/EC (Seveso II) from 1 June 2015**
Listed Category E1

**Chemical safety assessment**
Performed for this substance: YES

## 16 Other information

### Other information

**Full text of H & P - Statements referred to under section 2**
**Hazard statements**

| | |
|---|---|
| H290 | May be corrosive to metals. |
| H314 | Causes severe skin burns and eye damage. |
| H400 | Very toxic to aquatic life. |
| H411 | Toxic to aquatic life with long lasting effects. |

**Precautionary statements**

| | |
|---|---|
| P234 | Keep only in original container. |
| P260 | Do not breathe dust/fume/gas/mist/vapours/spray. |
| P264 | Wash thoroughly after handling. |
| P273 | Avoid release to the environment. |
| P280 | Wear protective gloves/protective clothing/eye protection/face protection. |
| P301+P330+P331 | IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. |
| P303+P361+P353 | IF ON SKIN (or hair): Remove/Take off Immediately all contaminated clothing. Rinse SKIN with water/shower. |
| P304+P340 | IF INHALED: Remove victim to fresh air and Keep at rest in a position comfortable for breathing. |
| 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 or doctor/physician. |
| P321 | Specific treatment (see P330+P351+P353 on this label). |
| P363 | Wash contaminated clothing before reuse. |
| P390 | Absorb spillage to prevent material damage. |

| | |
|---|---|
| P391 | Collect spillage. |
| P405 | Store locked up. |
| P406 | Store in corrosive resistant container with a resistant inner liner. |
| P501 | Dispose of contents and container in accordance with local, regional, national, international regulations. |

**Labelling REGULATION (EC) No 1272/2008**

**Signal Word**

Danger

**Pictograms Hazard to Human**

| | |
|---|---|
| GHS05 | Corrosive hazard |
| GHS09 | Environmental hazard |

**Pictogram Hazard during Transport**

| | |
|---|---|
| Class 8 | Corrosive substance |

**Training advice**

Provide adequate information, instruction and training for operators.

**Acronyms:**

| | |
|---|---|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| CAS | Chemical Abstract Service |
| EC | Effective Concentration |
| EINECS | European Inventory of Existing Commercial Chemical Substances |
| ICSC | International Chemical Safety Cards |
| LC | Lethal Concentration |
| LD | Lethal Dose |
| LOAEL | Lowest Observed Adverse Effect Level |
| LOEC | Lowest Observed Effect Concentration |
| NFPA | National Fire Protection Agency (USA) |
| NIOSH | National Institute for Occupational Safety and Health (USA) |
| NOAEL | No Observed Adverse Effect Level |
| NOEC | No Observed Effect Concentration |
| OSHA | Occupational Safety and Health Administration (USA) |
| PEL | Permissible Exposure Limit |
| REL | Recommended Exposure Limit |
| RTECS | Registry of Toxic Effects of Chemical Substances |
| TWA | Time-Weighted Average |

**Information sources**


1. ECHA https://www.echa.europa.eu/web/guest/registration-dossier/-/registered-dossier/15516/1
2. National Center for Biotechnology Information. PubChem Database. Sodium hypochlorite, CID=23665760, https://pubchem.ncbi.nlm.nih.gov/compound/23665760 (accessed on Apr. 10, 2019)


**Compiled by Aquatrade Water Treatment Chemicals (Pty) Ltd, R. van Rooyen, SHEQ Co-ordinator and E. Le Sar, Director.**

**MANUFACTURER/SUPPLIER DISCLAIMER:**

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Revision History

| Revision | Date | Change |
|---|---|---|
| 1.0 | 2019/04/11 | Preparation of the safety data sheet according to SANS 11014:2010 |
| | | |
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|---|---|---|
| | | |