

## STERILIZE 002 - A UNIVERSAL BIODEGRADABLE DISINFECTANT



### STERILIZE 002

#### All Purpose Cleaner and Disinfectant Fluid

#### Sterilize 002<sup>®</sup> at a glance

- The disinfectant against Bacteria, Viruses and Fungi
- No risk of building up resistancy
- The all purpose disinfectant
- Stable in solution even at elevated temperatures  
this gives a long-lasting activity in the application
- Safe to handle  
both powder and in aqueous solution
- Good cost-performance
- Not corrosive to equipment, housing, etc.
- Safe to nature  
readily biodegradable and non of the typical chlorine properties
- Easily formulated into blends  
its low dosage and principle of reactivity to micro organisms solely make it safe for other ingredients  
in the formulations
- Excellent storage stability

#### Sterilize 002<sup>®</sup>, the universal disinfectant

Micro-organisms extract a huge toll in terms of human suffering, lost productivity and economic damage. They do not affect only people, but also livestock, crops and even inanimate objects. Algae may foul huge volumes of water or cause accidents on slippery paths. Moulds can taint food and attack textiles, wood, painted surfaces and the like.

Food-born bacteria not only cost money through spoilage. They can also cause infection and poisoning. Despite improved food-handling techniques, codes of hygiene and heightened insight into temperature regulation as a control mechanism, the number of gastrointestinal diseases is actually on the rise, particularly in highly developed regions.

Vaccination schemes, antibiotics and other medications have only limited effectiveness. Some bacteria and fungi produce toxins that cannot be counteracted. Many microbial diseases cannot be cured. New, resistant strains of micro-organisms are appearing.

The best means of combating disease is prevention. The best means of prevention is a universal disinfectant that is safe, easy to use and effective against all bacteria, fungi and viruses detrimental to the health of humans, animals and plants.

Sterilize 002<sup>®</sup> is one of the few disinfectants capable of meeting these criteria. Based on a chemical substance known as Sodium N-Chloro-para-Toluenesulfonamide, or "Chloramine T" for short, Sterilize 002<sup>®</sup> ionizes when dissolved in water.

The Chloramine T ion reacts with organic material like proteins or enzymes it encounters, by that quickly destroying cell material or disrupting essential cell processes. Because Sterilize 002<sup>®</sup> attacks microbes through a process of oxidation, they cannot build up a resistance to it. In addition, the Chloramine T ion is highly stable and remains active over an extended period of time.

Sterilize 002<sup>®</sup> is a unique product. Unlike many germicides, which can also be toxic to other life forms, it is effective even at very low concentrations and therefore completely safe. It is even used to disinfect skin and wounds, as well as for personal hygiene. At the same time, it can literally be a life-saver when applied as a reliable disinfectant of drinking water in remote areas and during disasters.

Unlike other chlorine-based disinfectants, the formation of harmful chlorinated organic compounds (AOX) is negligible with Sterilize 002<sup>®</sup>. As a fast-acting disinfectant that remains stable for several days in solution and at least one year in solid form, Sterilize 002<sup>®</sup> has a low toxicity, is readily biodegradable and does not accumulate in the environment.

## **Sterilize 002<sup>®</sup> in Formulations**

### **Introduction**

In most of its applications Sterilize 002<sup>®</sup> is in an aqueous solution working excellently without the need additives. However for certain applications making a formulation by mixing Sterilize 002<sup>®</sup> with other compounds improves the total performance. This can be for applications like laundry or dish-washing detergents in which Sterilize 002<sup>®</sup> acts as a bleaching as well as a disinfecting agent. Sterilize 002<sup>®</sup> is a strong enough oxidant to remove tea-stains in the dish-washing application. In laundry detergent and textile bleaching applications however Sterilize 002<sup>®</sup> is preferred to stronger oxidants because it has good bleaching properties, without having a negative influence on the strength of the fiber. Other Sterilize 002<sup>®</sup> formulation applications range from kitchen cleaners and lavatory cleaners, to cow-teat disinfectants. Here Sterilize 002<sup>®</sup> is mainly used because of its universal characteristics as a disinfectant. With Sterilize 002<sup>®</sup> both solid and liquid formulations can easily be made.

The excellent stability of Sterilize 002<sup>®</sup> in powder as well as in aqueous solution together with the wide range of compounds with which it is compatible make it a perfect choice for formulated end products. In this technical bulletin some guidelines are given for formulations with Sterilize 002<sup>®</sup>.

### **General Criteria**

The disinfecting and bleaching ability of Sterilize 002<sup>®</sup> is based on its oxidative properties. Obviously reducing compounds should not be used because they would inactivate the Sterilize 002<sup>®</sup>. Also compounds containing ammonium or amine groups should be avoided. In reaction with Sterilize 002<sup>®</sup> exchange of the active Chlorine atom might occur.

Acidic compounds as well as compounds that by slow oxidation with Sterilize 002<sup>®</sup> form acidic compounds are incompatible with Sterilize 002<sup>®</sup>. These compounds induce a decomposition of Sterilize 002<sup>®</sup>.

## Surface Active Agents

The addition of Sterilize 002<sup>®</sup> to water does not change the surface tension of the solution. When some foaming or wetting properties are required in addition to the disinfection or bleaching properties a surface active agent should be added.

Non-ionic surfactants like ethoxylated fatty acids and ethoxylated nonylphenols, as well as anionic surfactants like alkylsulphonates, alkyl-aryl sulphonates and alkyl sulphates, have shown good compatibility with Sterilize 002<sup>®</sup>.

## Viscosity Controlling Compounds

For liquid formulations it can be an advantage to increase the viscosity of the solution. Carboxymethyl cellulose, polyvinylalcohol and polyacrylates can be used to control the viscosity of liquid Sterilize 002<sup>®</sup> formulations.

## Chelating Agents

The presence of water hardness (calcium and magnesium), but also other trace metals, can negatively influence the disinfecting as well as cleaning properties of a formulation. Addition of chelating agents can significantly reduce this influence. Polyphosphates, aminopolycarboxylates as well as phosphonic acid based chelates can be used as chelating agents in Sterilize 002<sup>®</sup> formulations.

## pH Controlling Additives

On dissolving Sterilize 002<sup>®</sup> in water a neutral to weakly alkaline solution will be obtained. Depending on the concentration the pH will range from approx. 7 to 9.5. The pH influences the activity of a Sterilize 002<sup>®</sup> solution, the efficacy increases at lower pH values. This can be partly explained by the presence of different active components at acidic pH values (see Technical Bulletin Biocidal Action Mode), but also by the influence of the pH on the redox potential of the Sterilize 002<sup>®</sup> ion.

The graph below shows the influence of the pH on the stability of a Sterilize 002<sup>®</sup> solution. From this graph it can be seen that in order to boost the bleaching and/or disinfecting activity of a Sterilize 002<sup>®</sup> solution lowering the pH is an option. This can be done by the addition of citric acid, acetic acid, lactic acid or sulphuric acid. Hydrochloric acid should not be used because of possible Chlorine gas formation. The stability of the solution even at acidic pH values is good enough to prevent any loss of activity during the application period (ranging from a few minutes to a few hours).

However especially for liquid formulations it will be clear that acidic pH values should be avoided, because this would limit the shelf-life of the formulation too much.

Additives to increase the pH of a Sterilize 002<sup>®</sup> solution to weakly or even highly alkaline values can easily be used.

Additives for this purpose proven to be compatible are: sodium and potassium carbonates; metasilicate; sodium and potassium hydroxide.

## Solubility

When making liquid formulations the composition should be such that crystallization is prevented. The graph presented below shows the solubility of Sterilize 002<sup>®</sup> in pure water at different temperatures. From this graph one can determine what concentration is feasible in order to prevent crystallization of Sterilize 002<sup>®</sup>. It shows that the addition of other salts to a Sterilize 002<sup>®</sup> solution influences the solubility of Sterilize 002<sup>®</sup>.

## Formulation examples

In literature a number of solid as well as liquid formulations containing Sterilize 002<sup>®</sup> have been published. On request a list of references about this subject can be obtained.

**Micro-organisms against which Sterilize 002<sup>®</sup> has proven to be active**



Sterilize 002<sup>®</sup> is unique in killing of micro organisms

The universal character of Sterilize 002<sup>®</sup> is reflected not only by the wide diversity of application areas, but also by the wide variety of microorganisms versus which Sterilize 002<sup>®</sup> is an effective germicide. Sterilize 002<sup>®</sup> is efficacious against the whole range of micro-organisms, including Gram-negative and Gram-positive bacteria, fungi and viruses. Most disinfectants particularly have no activity versus so-called naked viruses at all. Here again Sterilize 002<sup>®</sup> stands out as an ally in combating viral contaminations.

International testing confirms above claim and establishes Sterilize 002<sup>®</sup> as an all-round and highly versatile disinfectant.

Its mechanism is triggered in a watery solution by the presence of micro-organisms. Active groups are released in proportion to the demand and penetrate the cell walls of the micro-organisms concerned leading to their inevitable destruction without the risk of a resistance build-up. What matters are the right strength and the proper time of exposure.

### **Micro-organisms against which Sterilize 002<sup>®</sup> has proven to be active**

#### **Bacteria**

Achromobacter anitratus  
Acinetobacter spp  
Actinobacillus pleuropneumoniae  
Aeromonas hydrophila  
Aeromonas salmonicida  
Agrobacterium tumefaciens  
Alcaligenes faecalis  
Bacillus antaecis  
Bacillus anthracis  
Bacillus cereus  
Bacillus diphtheria  
Bacillus dysentery  
Bacillus mesentericus  
Bacillus subtilis spores  
Bacillus subtilis  
Bacillus thuringiensis  
Bacterium enteritidis Gaertner  
Bacterium paratyphi  
Bacterium rhusopatha  
Bacterium septicaemiae haermorigael  
Bacterium typhi gallinarum  
Brucella abortus bang  
Brucella suis  
Campylobacter spp. Jejuni  
Clavibacter michiganese  
Clostridium welchii  
Clostridium sporogenes  
Clostridium bifermentas  
Clostridium tertium  
Clostridium histolyticum  
Clostridium caloritolerans  
Corynebacteriummichiganese  
Corynebacterium spp.  
Enterobacter aerogenes



Enterobacteriaceae Citrobacter  
Enterobacteriaceae Hafnia  
Enterobacteriaceae Klebsiella  
Enterobacteriaceae Kluvera  
Enterobacteriaceae Serratia  
Enterococcus faecium  
Erwinia carotovora  
Escherichia coli  
Escherichia tarda  
Flavobacterium branchiophilum  
Flavobacterium columnaris  
Flavobacterium haematocrits  
Flexibacter maritimus  
Isaria farinosa  
Lactonacillus spp.  
Legionella pneumophila  
Klebsiella pneumoniae  
Listeria monocytogenes  
Micrococcus avium  
Micrococcus citreus  
Micrococcus pyogenes  
Moraxella spp  
Mycobacterium avium  
Mycobacterium lacticola  
Mycobacterium minetti  
Mycobacterium pellegrino  
Mycobacterium phlei  
Mycobacterium piscium  
Mycobacterium smegmatis  
Mycobacterium vole bacillus  
Pasteurella  
Pediococcus cerevisiae  
Proteus mirabilis  
Proteus vulgaris  
Pseudomonas aeruginosa  
Pseudomonas fluorescens  
Pseudomonas fragi  
Pseudomonas putida  
Pseudomonas putrefaciens  
Pseudomonas pyocyanea  
Pseudomonas solanacearum  
Pseudomonas tolaasii  
Pyocyaneus  
Salmonella anatum  
Salmonella dublin  
Salmonella durban  
Salmonella livingstone  
Salmonella newbrunswick  
Salmonella newport  
Salmonella oranienburg  
Salmonella paratyphi B  
Salmonella pullorum  
Salmonella rostock  
Salmonella senftenberg



Salmonella thompson  
 Salmonella typhimurium  
 Sarcina lutea  
 Shigella boydii  
 Shigella sonnei  
 Spicaria pracina  
 Staphylococcus aureus  
 Staphylococcus aureus haemolyticus  
 Staphylococcus bag  
 Staphylococcus paratyphosa B  
 Staphylococcus pyogenes  
 Streptococcus agalactiae  
 Streptococcus faecalis  
 Streptococcus faecium  
 Streptococcus lactis Blaser Sveitsi  
 Vibrio alginoliticus  
 Vibrio anguillarum  
 Vibrio cholerae  
 Vibrio harveyi  
 Vibrio parahaemolyticus  
 Vibrio salmonicida  
 Vibrio vulnifious  
 Yersinia enterocolitica  
 Yersinia pseudo-tuberculosis  
 Yersinia ruckerii  
 Xanthomonas hyacinthi  
**Viruses**  
 Adenovirus  
 African swine fever virus  
 Aujeszky Disease virus  
 Avian reovirus  
 Canine parvovirus  
 Celovirus  
 Classical swine fever virus  
 Corona virus  
 Coxsackie virus  
 Diphteria virus  
 Ektromelie virus  
 Encephalomyocarditis virus  
 Enteric cytop. bovine orphan virus (ECBO)  
 European swine fever virus  
 Foot and Mouth Disease virus  
 Fowl plague virus  
 Fowl pox virus  
 Gumboro Disease virus  
 Hepatitis B virus  
 Hepatitis contagiosa canine virus  
 Herpes virus  
 Human Immuno-Deficiency virus (HIV)  
 Human rotavirus  
 Infectious bronchitis virus  
 Infectious bursitis virus  
 Infectious pancreatic necrosis  
 Infectious salmon anaemia (ISA) virus



Influenza virus  
Irido virus (ASFV)  
Myxomatosis virus  
New Castle Disease virus (NCD)  
Nuclear polyhedron virus  
Orthopox commune virus (vaccinia)  
Paramyxo virus  
Pepino mosaic virus  
Picorna virus  
Poliovirus  
Porcine parvovirus  
Pox virus  
Pseudo Bird Pest virus  
Rabies virus (fixed)  
Reovirus  
Retro virus  
Rhino pneumatic virus  
South African Pest virus  
Swine fever virus  
Systematic ectodermal and mesodermal  
baculo virus (SEMBV)  
Teshen virus  
Toga virus  
Vaccinia virus  
Vesicular Swine Disease virus  
White spot disease virus (SMBV)

### **Fungi**

Aspergillus amstellodami  
Aspergillus flavus  
Aspergillus fumigatus  
Aspergillus gr. glaucus  
Aspergillus niger  
Aspergillus oryzae  
Aspergillus ochraceus  
Aspergillus versicolor  
Byssochlamys nivea  
Chaetomium globosum  
Cladosporium herbarum  
Cladosporium cladosporoides  
Entomophthora destruens  
Entomophthora thaxteriana  
Entomophthora virulenta  
Epidermophyton floccosum  
Fusarium moniliforme  
Geotrichum candidum  
Microsporum canis  
Microsporum gypseum  
Myrothecium verrucaria  
Oöspora lactis  
Paecilomyces variotii  
Penicillium cyclopium  
Penicillium funiculosum  
Penicillium granulatum  
Penicillium roqueforti



Penicillium verrucosum  
 Saprolegnia parasitica  
 Tilletia caries  
 Trichoderma viride  
 Trichophyton equinum  
 Trichophyton mentagrophytes  
 Wallemia ichthyophaga

**Algae**

Anabaena cylindrica  
 Chlorella vulgaris  
 Oscillatoria tenuis  
 Skeletonema sp.  
 Stigeoclonium sp.  
 Tetraselmis sp.

**Yeasts**

Candida albicans  
 Cryptococcus spp  
 Saccharomyces cerevisiae  
 Saccharomyces diastaticus

**Parasites**

Epistylis  
 Gill trematoda  
 Gyrodactylus salaris  
 Ichtyobodo necator  
 Ichtyophthirius multifillis  
 Labyrinthuloides haliotides  
 (Labyronthomorpha)  
 Neoparamoeba pemaquidensis

Testing continues. Please contact us if your troublesome bacteria, virus or fungus is not listed. There are no bacteria and viruses known to which Sterilize 002<sup>®</sup> is not effective. The actual required dosage is dependant on practical conditions, such as contact time, organic matter and temperature, which may be different from testing circumstances.

**Storage stability**

Sterilize 002<sup>®</sup> has superior storage stability. The shelf life of Sterilize 002<sup>®</sup> is guaranteed for two years after production.

Tests have shown that, if properly stored, Sterilize 002<sup>®</sup> will not undergo significant changes in quality even after several years of storage.

| Product                    | Active content | Dry and cool | High humidity and temperature |
|----------------------------|----------------|--------------|-------------------------------|
| Sterilize 002 <sup>®</sup> | ± 100 %        | ++           | ++                            |
| DCIC                       | ± 98 %         | ++           | +/-                           |



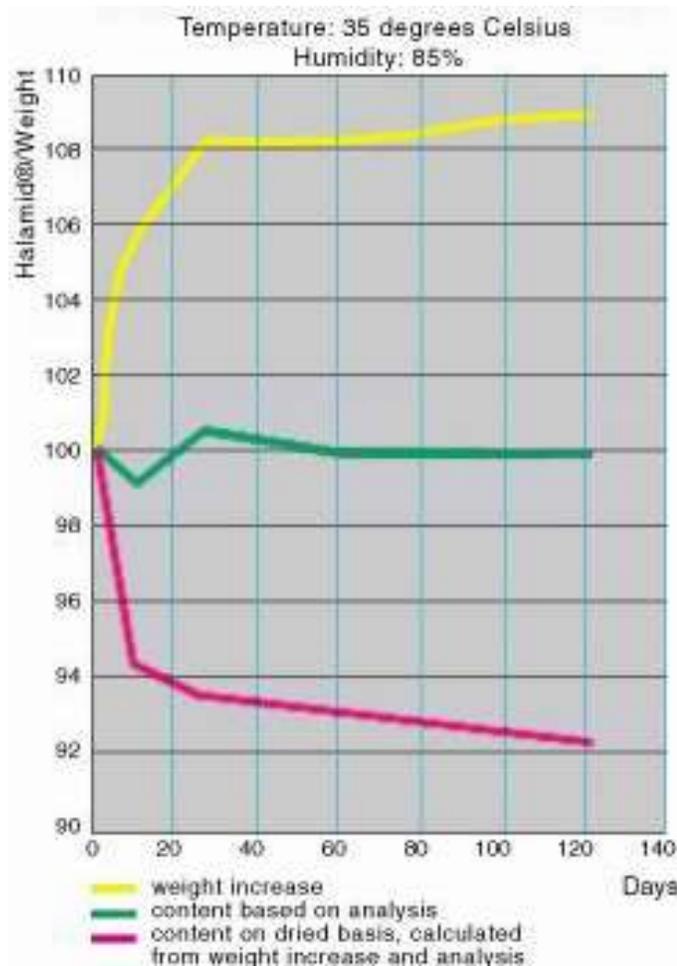
|           |        |     |   |
|-----------|--------|-----|---|
| Ca (OCI)2 | ± 65 % | +/- | - |
| H2O2*     | ± 40 % | ++  | + |

\*Only valid for the purest quality

In order to determine the storage stability of Sterilize 002<sup>®</sup> under tropical conditions a test was performed at 35 °C and 85% relative humidity. 25 kgs of Sterilize 002<sup>®</sup> packed in its original 4 ply paper bag were placed in a constant climate cupboard for 120 days. During this period the weight and the content of the Sterilize 002<sup>®</sup> were regularly checked. After 120 days of storage at 35 °C and 85% relative humidity the Sterilize 002<sup>®</sup> packed in its original bag proved not to have been changed in weight or content.

A similar test was run but now with Sterilize 002<sup>®</sup> in open contact with the humid air. In the first 30 days of this experiment the weight of the Sterilize 002<sup>®</sup> increased while the content declined. After that period the weight and content of the Sterilize 002<sup>®</sup> were more or less stable. The weight increase was caused by water adsorption which resulted in a content reduction exactly proportional to the content decrease analyzed. No decomposition of Sterilize 002<sup>®</sup> could be detected. All this proves that Sterilize 002<sup>®</sup> is a product with superior storage stability even under non-ideal conditions.

### Stability of Sterilize 002:



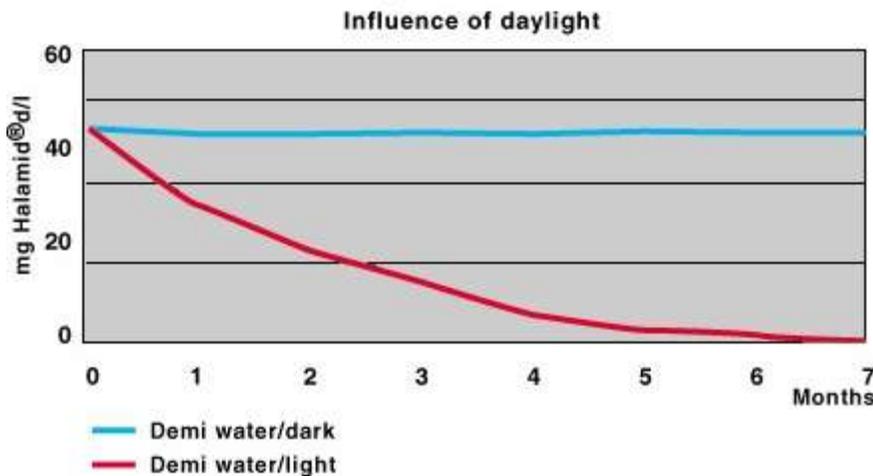
## Stability in solution

Sterilize 002<sup>®</sup> is stable in solution, even at elevated temperatures. To do its work as a disinfectant Sterilize 002<sup>®</sup> must be dissolved in water. Its aqueous solutions show a remarkably good stability. [Figure 1](#) shows stability test results of a 5% Sterilize 002<sup>®</sup> solution at 25 °C. If stored in the dark or stored in a non-transparent container, e.g. a brown glass bottle or a non-transparent polyethylene container, after 7 months less than 1% activity, so less than 0.05% Sterilize 002<sup>®</sup>, is lost due to decomposition.

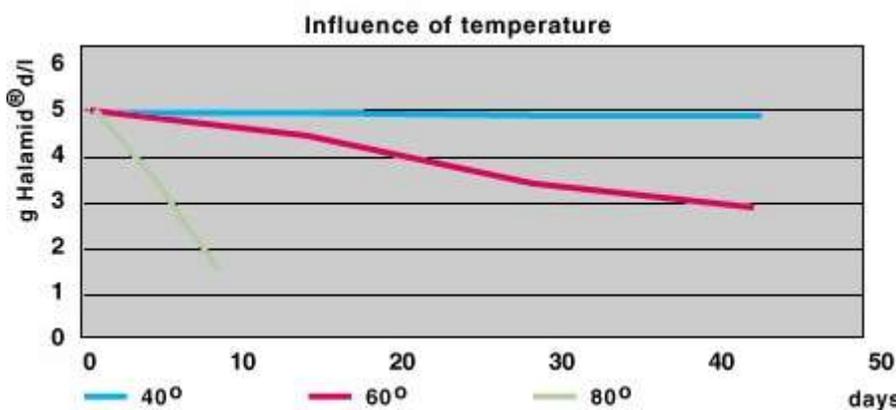
Even at elevated temperatures Sterilize 002<sup>®</sup> solutions show a good stability. In [Figure 2](#) the stability of a 0.5% Sterilize 002<sup>®</sup> solution at 40, 60 and 80 °C is given. The solutions were stored in non-transparent polyethylene containers. After 4 weeks at only 40 °C only 2,5% activity, so 0.01 % Sterilize 002<sup>®</sup>, is lost.

[Figure 3](#) shows stability results of 15 mg/l Sterilize 002<sup>®</sup> solutions. Here again the influence of direct light can be seen from the difference between curve A and B. Curve C shows the influence of water type. If Sterilize 002<sup>®</sup> is dissolved in river water, containing micro-organisms and organic matter, after 24 hours about half of the Sterilize 002<sup>®</sup> is still active. After 1 week 90% of the activity is gone due to reaction with micro-organisms, organic matter and decomposition influenced by the direct sunlight. The excellent stability of Sterilize 002<sup>®</sup> solutions guarantees long lasting disinfecting activity and makes it possible to prepare stock solutions.

**Figure 1 The stability of 50g/l Sterilize 002 solution (5%) at 25<sup>0</sup>C**

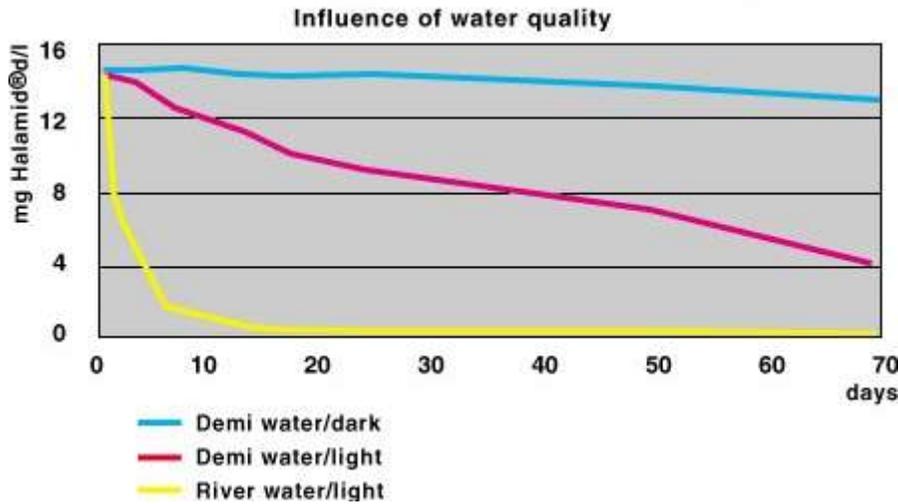


**Figure 2 The stability of a 5g/l Sterilize 002 solution (0.5%)**



P. J. Roos and C. H. Vermaat Ziekenhuisfarmacie, 1-1985

**Figure 3 The stability of a 15mg/l Sterilize 002 solution (0.0015%) at 25<sup>0</sup>C**



## Toxicity

### Safe to nature

Sterilize 002<sup>®</sup> has a low acute toxicity level of LD50 - 1,000 mg/kg in rats and mice. Its 90-day no effect level (NOEL) in rats is 15 mg/kg/day. Acute inhalation tests in rats produced no mortality upon exposure of 4 hours to a mist of 5% Sterilize 002<sup>®</sup> solution, equivalent to 4.2 mg Sterilize 002<sup>®</sup>/dm<sup>3</sup>.

### Safe to handle, both in powder form in aqueous solutions

Sterilize 002<sup>®</sup> is transported mainly in its pure crystalline powder form. When used as a disinfectant it is dissolved in water and applied as an aqueous solution. The [toxicity data](#) show that Sterilize 002<sup>®</sup> is a product that is Safe to Handle both as a solid and in aqueous solution.

### Oral toxicity

acute oral LD 50 in mice 1,200 mg/kg  
 LD 50 in rats 1,010 mg/kg

90 days subchronic "no-effect level" in rats

### Inhalation toxicity

acute inhalation 5% solution rats, 4 hours LC 50 4.2 mg/l  
 acute inhalation powder rats, 4 hours LC 50 275 mg/m<sup>3</sup>

### Dermal toxicity

Solution 8% : non irritating to rabbit skin  
 Moistened solid : caused skin irritation in 2 out of 6 rabbits in the test

Based on the moistened solid test results Sterilize 002<sup>®</sup> in its powder form has to be labeled as a substance corrosive to the skin.

## Eye irritation

Rabbits

0.5 % solution : non-irritating

10% solution : mildly irritating, no damage to cornea and iris

powder : highly irritating, cornea, iris and conjunctiva damaged

## Acute/prolonged toxicity

Fish (Poecilia reticulata) LC50 96 h : 31 mg/l

Daphnia magna EC50 48 h : 4.5 mg/l

Algae (Chloella pyreoidosa) EC50 96 H : 80 mg/l

Bacteria (Pseudomonas putida) EC10 : 10 mg/l

## Chronic toxicity

Fish (Pimephales promelas) NOEC : 1.5 mg/l

Fish (Daphnia magna) NOEC : 1.1 mg/l

## Biodegradation

Biodegradation was tested using the Repitive Die Away Test. Sterilize 002<sup>®</sup> proved to be **readily biodegradable** (90% in 28 days).

## Toxicity to activated sludge bacteria

Aerobic saprophytic bacetria EC50 : 5 mg/l

Nitrifying bacteria EC50 : 700 mg/l

Methanogenic bacteria EC50 :1.000 mg/l

## Adsorption by soil and sludge

Less than 500 mg per kg organic matter in soil and sludge.

## Bioaccumulation

The good solubility in water of Sterilize 002<sup>®</sup>, its low adsorption to soil and sludge and its speedy biodegradability indicate a low bioaccumulation potential.

Based on the data above Sterilize 002<sup>®</sup> needs, according to Eec criteria, **NO** labeling as being Dangerous to the Environment.

## Chlorination ability/AOX formation

Although an active chlorine containing substance, Sterilize 002<sup>®</sup> shows hardly any chlorination ability. In comparative tests with hypochlorite and dichloroisocyanurate Sterilize 002<sup>®</sup> proved to form far less [AOX \(Absorbable Organic Halogens\)](#) compounds. Even non-active chlorine containing substances like persulphate and peracetic acid proved, in the presence of minor amounts of chloride ions (almost omnipresent), to form more AOX than Sterilize 002<sup>®</sup>.



## MSDS

Despite its biocidal activity, Sterilize 002® is not labelled as harmful to the environment. This proves the unique feature of reliable biocidal activity with care for the environment.

### SAFETY DATA SHEET

According to EC-directive 93/112/EC

STERILIZE 002 TM - Germ GH20: All Purpose Cleaner and Disinfectant Fluid - Chloramine T

1. [Identification of the substance/preparation and of the company/undertaking](#)
2. [Composition/information on ingredients](#)
3. [Hazards identification](#)
4. [First aid measures](#)
5. [Fire-fighting measures](#)
6. [Accidental release measures](#)
7. [Handling and storage](#)
8. [Exposure controls/personal protection](#)
9. [Physical and chemical properties](#)
10. [Stability and reactivity](#)
11. [Toxicological information](#)
12. [Ecological information](#)
13. [Disposal considerations](#)
14. [Transport information](#)
15. [Regulatory information](#)
16. [Other information](#)

#### 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

**Product label name** Sodium p-toluenesulfonchloramide  
**Supplier** Akzo Nobel Chemicals bv  
Stationsplein 4  
PO Box 247  
NL-3800 AE Amersfoort  
Tel.: +31-334676767  
**Emergency telephone** +31 570679211 (Fax. +31 570679801)  
Akzo Nobel Chemicals-Deventer-NL  
  
+44-1634280888  
Akzo Nobel Chemicals-Gillingham-GB

#### 2. COMPOSITION/INFORMATION ON INGREDIENTS

This product is to be considered as a substance in conformance to EC directives Information on hazardous ingredients

##### Chemical description

Sodium p-toluenesulfonchloramide

##### Composition / information on ingredients

| Number | %w/w | CAS-number | Chemical name                   |
|--------|------|------------|---------------------------------|
| 1      | 100  | 127-65-1   | Sodium p-toluensulfonchloramide |

| Number | EC-number | Annex-1 number | Symbol(s) | Risk-phrase(s)     |
|--------|-----------|----------------|-----------|--------------------|
| 1      | 204-854-7 | 616-010-00-9   | C         | R22, R31, R34, R42 |



### 3. HAZARDS IDENTIFICATION

Harmful if swallowed.                      Contact with acids liberates toxic gas.  
Causes burns.                                May cause sensitization by inhalation.

### 4. FIRST AID MEASURES

**Symptoms and effects**                      Causes injury to the cornea and eyelids. Causes burns. May cause sensitization by inhalation and skin contact.

#### **First aid**

**General** Obtain medical attention immediately (show this Safety Data Sheet). Move to fresh air, rest, half upright position, loosen clothing. Oxygen or artificial respiration if there is difficulty in breathing. Seek medical advice after significant exposure.

**Skin** Remove all contaminated clothing immediately. Wash off with plenty of soap and water. Always seek medical advice. Launder clothes before reuse.

**Eye** Rinse immediately and as long as possible with plenty of water. Eyelids should be held away from the eyeball to ensure thorough rinsing. Always seek medical advice.

**Ingestion** Only when conscious, rinse mouth, give plenty of water to drink (approx. 500ml). DO NOT induce vomiting. Seek medical advice.

**Advice to physician**                      Symptomatic treatment is advised.

### 5. FIRE-FIGHTING MEASURES

**Extinguishing media**                      foam, powder, waterspray, carbon dioxide.

**Unsuitable extinguishing media**                      none known.

**Special exposure hazards** In case of fire and/or explosion do not breathe fumes

**Hazardous decomposition/Combustion products**                      Emits toxic fumes under fire conditions (hydrochloric acid (HCl), nitrous gasses (NOx), sulphur dioxide (SO<sub>2</sub>).

**Protective equipment**                      Wear self contained breathing apparatus.

### 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**                      Do not breathe dust. Avoid contact with skin and eyes. For personal protection see [section 8](#).

**Environmental precautions**                      Do not allow to escape into sewage system or water courses.

**Methods for cleaning up**                      Collect as much as possible in a clean container for (preferable) reuse or disposal.  
Flush remainder with water.

### 7. HANDLING AND STORAGE

**Handling**    The usual precautions for handling chemicals should be observed.

**Fire and explosion prevention** No specific recommendations.

**Storage requirements**                      Keep in a cool place. Keep container tightly closed and dry.



## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Engineering controls** Avoid inhalation of dusts.

**Exposure limits** No exposure limit has been established

### Personal protection

**Respiratory** In case of dust formation use dust mask (respirator with Filter P2)

**Hand** protective gloves.

**Eye** safety goggles.

**Skin and body** protective clothing

**Other information** Remove contaminated clothing. Launder clothes before reuse.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

|  |                                     |
|--|-------------------------------------|
| <b>Appearance</b>                            | crystalline powder                  |
| <b>Colour</b>                                | white                               |
| <b>Odour</b>                                 | weak chlorine                       |
| <b>Boiling point/range</b>                   | not applicable                      |
| <b>Melting point/range</b>                   | Decomposes                          |
| <b>Flash point</b>                           | 192 °C (Pensky-Martens, closed cup) |
| <b>Flammability</b>                          | not determined                      |
| <b>Autoignition temperature</b>              | not determined                      |
| <b>Explosive properties</b>                  | not determined                      |
| <b>Explosion limits</b>                      | not determined                      |
| <b>Oxidizing properties</b>                  | not determined                      |
| <b>Vapour pressure</b>                       | not determined                      |
| <b>Density</b>                               | 1430 kg/m <sup>3</sup>              |
| <b>Bulk density</b>                          | 540-680 kg/m <sup>3</sup>           |
| <b>Solubility in water</b>                   | 150 g/l (25°C)                      |
| <b>Solubility in other solvents</b>          | ethanol (95%): 75 g/l (20°C)        |
| <b>pH value</b>                              | 8.0-10.3 (5% solution)              |
| <b>Partition coefficient n-octanol/water</b> | not determined                      |
| <b>Relative vapour density (air=1)</b>       | not relevant                        |
| <b>Viscosity</b>                             | not applicable                      |

## 10. STABILITY AND REACTIVITY

|   |  |
|---|--|
| <b>Stability</b>                        | Stable under recommended storage and handling conditions (see <a href="#">section 7</a> ). |
| <b>Conditions to avoid</b>              | Unstable in contact with water vapour.<br>Contact with acids liberates toxic gas.          |
| <b>Materials to avoid</b>               | Water vapour, acids  |
| <b>Hazardous decomposition products</b> | chlorine   |



## 11. TOXICOLOGICAL INFORMATION

|                        |   |
|------------------------|---|
| <b>Name</b>            | Sodium p-toluenesulfonchloramide  |
| <b>Acute toxicity</b>  |   |
| <b>Oral LD50</b>       | rat, mouse: approx. 1000 mg/kg (Akzo Nobel E-file)  |
| <b>Inhalation LC50</b> | rat: > 0.275 mg/l (4 hours) (max. attainable concentration) (Akzo Nobel E-file)   |
| <b>Irritation</b>      |   |
|                        | <b>Skin</b> Moistened powder: Corrosive (Akzo Nobel E-file)<br>8% solution: Non-irritating (Akzo Nobel E-file)  |
|                        | <b>Eye</b> Moistened powder: Severely irritating (Akzo Nobel E-file)<br>8% solution: Moderately irritating (Akzo Nobel E-file)<br>0.5% solution: Non irritating (Akzo Nobel E-file) |
|                        | <b>Sensitization</b> May cause sensitization by inhalation and skin contact (Akzo Nobel E-file)   |
|                        | <b>Genotoxicity</b> Ames test: non mutagenic (Akzo Nobel E-file)<br>Micronucleus test: not mutagenic (Akzo Nobel E-file)  |
|                        | <b>Other toxicological information</b> subchronic (90 days) oral toxicity, rat: No Observed Effect Level 15 mg/kg/day (Akzo Nobel E-file)   |

## 12. ECOLOGICAL INFORMATION

|                           |  |
|---------------------------|--|
| <b>Name</b>               | Sodium p-toluenesulfonchloramide   |
| <b>Ecotoxicity</b>        |  |
|                           | <b>Fish</b> 96h-LC50 (Poecilia reticulata) : 31 mg/l (Akzo Nobel E-file)   |
|                           | <b>Daphnia</b> 48h-EC50: 4.5 mg/l (Akzo Nobel E-file)  |
| <b>Fate</b>               |  |
| <b>Degradation Biotic</b> | Readily biodegradable (At low concentrations).<br>p-Toluenesulfonamide (hydrolysis product) : Readilybiodegradable |
| <b>Other information</b>  | Daphnia magna reproduction test: No Observed Effect Concentration (NOEC) > 1 mg/l (Akzo Nobel E-file)              |

## v13. DISPOSAL CONSIDERATIONS

|                               |   |
|-------------------------------|---|
| <b>Product</b>                | According to local regulations (most probably controlled incineration after decomposition/neutralization with water/caustic). |
| <b>Contaminated packaging</b> | According to local regulations.   |



## 14. TRANSPORT INFORMATION

### Land transport

|   |                               |                              |      |
|---|-------------------------------|------------------------------|------|
| ADR class   | 8                             | ADR item number              | 55c  |
| RID class   | 8                             | RID item number              | 55c  |
| Hazard Identification No.   | 80                            | Substance identification No. | 3263 |
| TREM-Card   | CEFIC TEC ®- 80 G09 UN number |                              | 3263 |
| Proper shipping name: Corrosive solid basic, organic, n.o.s. (Sodium p-toluenesulfonchloramide) |                               |                              |      |

### Sea transport

|   |             |           |                     |
|---|-------------|-----------|---------------------|
| IMO/IMDG code   | page 8150-1 | Class     | 8                   |
| Packaging group   | III         | UN Number | 3263                |
| EMS   | 8-15        | MFAG      | 760 +Subsection 4.3 |
| Marine pollutant  | no          |           |                     |
| Proper shipping name: Corrosive solid basic, organic, n.o.s. (Sodium p-toluenesulfonchloramide) |             |           |                     |

### Air transport

|   |   |                 |      |
|---|---|-----------------|------|
| ICAO-TI/ATA-DGR   |   | UN Number       | 3263 |
| Class   | 8 | Packaging group | III  |
| Proper shipping name: Corrosive solid basic, organic, n.o.s. (Sodium p-toluenesulfonchloramide) |   |                 |      |

## 15. REGULATORY INFORMATION

|   |   |
|---|---|
| <b>Chemical description</b>                 | Sodium p-toluenesulfonchloramide  |
| <b>Labelling according to EC directives</b> |   |
| <b>EC-number</b>                            | See <a href="#">section 2</a>   |
| <b>Classification based on</b>              | Annex-1 (24 <sup>th</sup> adaption)   |
| <b>Symbol(s)</b>                            | Corrosive ©   |
| <b>R(isk) phrase(s)</b>                     | R22: Harmful if swallowed<br>R31: Contact with acids liberates toxic gas<br>R34: Causes burns<br>R42: May cause sensitization by inhalation   |
| <b>S(afety) phrase(s)</b>                   | S7: Keep containe tightly closed<br>S22: Do not breathe dust<br>S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice<br>S36/37/39: Wear suitable protective clothing, gloves and eye/face protection<br>S45: In case of accident or if you feel unwell, seek medical advice immediately<br>(show the label where possible) |
| <b>Wassergefährdungsklasse (WGK)</b>        | 2   |

## 16. OTHER INFORMATION

This information only concerns the above mentioned product and does not need to be valid if used with other product(s) or in any process. The information is to our best present knowledge correct and complete and is given in good faith but without warranty. It remains the user's own responsibility to make sure that the information is appropriate and complete for this special use of this product.

### History

|                                     |   |
|-------------------------------------|---|
| <b>Revision</b>                     | 7.01  |
| <b>Composed by</b>                  | Dr. A.T.M. van der Steen, Dr.N.J. van Hoboken |
| <b>Changes were made in section</b> | 11  |
| <b>Date of last issue</b>           | 20-10-1998                                    |



## Packaging

Sterilize 002<sup>®</sup> is supplied in 25 kg paper bags and re-sealable plastic containers of 1, 5, 10 and 25 kgs.

For easy dosing Sterilize 002<sup>®</sup> can be supplied in polyvinyl alcohol sachets of various sizes. These dissolve in water, making the product available without any handling or weighing.

Sterilize 002<sup>®</sup> can also be delivered in tablets of 500 and 1,000 mg. Applications for tablets include skin disinfection and purification of drinking water. They are also used for the microbiological control of water for applications such as cut flowers.

## Biocidal mode of action

### Historical view on the biocidal mode of action

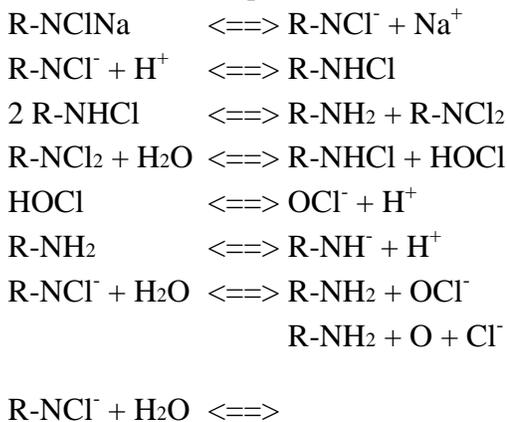
Since the first publication by Chattaway <sup>(1)</sup> in 1905 on Sodium N-Chloro-para-Toluenesulfonamide (Chloramine T, or by Akzo Nobel trade name Sterilize 002<sup>®</sup>) and the first introduction as a disinfectant by Dakin <sup>(2)</sup> in 1916 this product has been seen as slow hypochlorite (HOCl and/or OCl<sup>-</sup>) releasing agent. This although some authors reported about properties that conflicted with this theory <sup>(3,4)</sup>. Product properties conflicting with the theory of slow hypochlorite release in comparison to hypochlorite and chloro-isocyanurates are:

- excellent stability of the aqueous solution
- moderate pH dependence of the biocidal efficacy
- moderate influence of organic matter on the biocidal efficacy
- hardly any skin irritation
- hardly any chlorination ability.

## New Studies I

Recently some studies have been published that prove that the biocidal mode of action of Sterilize 002<sup>®</sup> is not based on the release of hypochlorite but must be explained by a different chemical mechanism.

Gottardi <sup>(4)</sup> calculated the theoretical composition of an aqueous Chloramine T solution at various pH values. In an aqueous solution of Chloramine T the following equilibria exist: ( R= CH<sub>3</sub>-C<sub>6</sub>H<sub>4</sub>-SO<sub>2</sub> )



According to these equilibria seven different compounds can be present in a Chloramine T solution. Based on the known equilibrium constants Gottardi calculated for various pH values the concentrations of the



individual compounds. If Chloramine T would be a slow hypochlorite releasing agent than the compounds HOCl and/or OCl<sup>-</sup> should be present at a significant level. However Gottardi showed that for a 0.1 % Chloramine T solution the hypochlorite concentrations [ OCl<sup>-</sup> ] and [ HOCl ] are:

|                                   |                         |             |
|-----------------------------------|-------------------------|-------------|
| at pH 3 : [ OCl <sup>-</sup> ] =  | < 0.01 ug/l, [ HOCl ] = | 14 ug/l     |
| at pH 7 : [ OCl <sup>-</sup> ] =  | 4 ug/l, [ HOCl ] =      | 14 ug/l     |
| at pH 10 : [ OCl <sup>-</sup> ] = | 35 ug/l, [ HOCl ] =     | 0.5 ug/l    |
| at pH 12 : [ OCl <sup>-</sup> ] = | 200 ug/l, [ HOCl ] =    | < 0.01 ug/l |

The biocidal effects of Chloramine T can never be explained by these minimal quantities of hypochlorite.

### **New Studies II**

Hahn et al<sup>(6)</sup> proved the theory of Gottardi by analysis. They developed an electrochemical analytical method by which they could detect very low concentrations of hypochlorite in a Chloramine T solution. They found that in an aqueous solution containing 2.5 g Chloramine T per liter the hypochlorite concentration is less than 100 ug/l. (this is the detection limit of the analytical method). Even if they deliberately add hypochlorite to the solution, it reacts quickly with solution components. At neutral and alkaline pH values it reacts with R-NH<sub>2</sub> (para-toluenesulfonamide), which -as Gottardi shows- is present at minor concentrations in a Chloramine T solution, to form Chloramine T. At acidic pH values it is reported to react with R-NHCl to form RNCI<sub>2</sub> ( dichloramine T ).

So based on theoretical as well as analytical proven facts one has to conclude that Sterilize 002<sup>®</sup> is not a slow hypochlorite releasing agent.

### **Present view on the biocidal mode of action of Sterilize 002<sup>®</sup>**

Gottardi calculated that the compounds responsible for the biocidal properties of a Chloramine T solution are:

|               |  |
|---------------|--|
| at pH < 3:    | R-NHCl and R-NCl <sub>2</sub> (Chloramine T acid and Dichloramine T)                                       |
| at pH 3 to 6: | R-NHCl, R-NCl <sup>-</sup> and R-NCl <sub>2</sub> (Chloramine T acid; Chloramine T ion and Dichloramine T) |
| at pH > 7:    | R-NCl <sup>-</sup> (Chloramine T ion)  |

At all pH values these molecules represent more than 99.99 % of the total amount of Chloramine T present in the solution.

### **So the biocidal mode of action of Sterilize 002<sup>®</sup> is:**

Sterilize 002<sup>®</sup>, dissolved in water, ionizes and forms the Chloramine T ion. This Chloramine T ion reacts with organic material, such as bacteria, fungi, viruses, with which it comes into contact. This oxidative reaction quickly kills the micro-organism, even at low concentrations and low temperatures. Because of the irreversibility of the oxidative reaction there is no possibility for the micro-organisms to create resistance.

**The biocidal properties of Sterilize 002<sup>®</sup> are based on the Chloramine T ion itself which is directly involved in the oxidative destruction of bacteria, viruses and fungi.**



## References:

1. F.D. Chattaway, J. Chem. Soc. 87, 151 (1905)
2. H.D Dakin, J.B. Cohen, M. Daufresne, J. Kenyon, Proc. Royal Soc. London Ser. B. 232-251, 1916
3. Kirk-Othmer, Encyclopedia of Chemical Technology, 5th edition, Volume 5, page 921
4. Ullmann's Encyclopedia of Industrial Chemistry, 4th edition, Band 9, page 389
5. W. Gottardi, Arch. Pharm., 325, 377-384, (1992)
6. M. Hahn, A. Liebau, H.H. Rüttinger, R. Thamm, Anal. Chim. Acta, 289, 35-42, (1994)



## Corrosion Data

### None-corrosivity to equipment, housing, etc.

According to EEC-regulations Sterilize 002<sup>®</sup> is to be labeled as a corrosive substance. However, this classification is based on the result of a skin irritation test performed with Sterilize 002<sup>®</sup> as a moistened solid powder. These tests have no relevance for determining material corrosion.

When applied as a disinfectant, Sterilize 002<sup>®</sup> is always used in an aqueous solution. The results of material corrosion tests with a 0.5% Sterilize 002<sup>®</sup> solution tests are presented in the table on the reserve side of this bulletin. From the results it can be concluded that Sterilize 002<sup>®</sup> has no or only a minor corrosive effect on materials commonly used in farms, shops, institutes and industries, like stainless steel, aluminum, concrete, wood, polymers.

### Corrosion table of Sterilize 002<sup>®</sup> solution, concentration 0.5% in water Objects exposed to continuous agitation at 50 °C for 48 hrs

| Material                  | Weight g/m <sup>2</sup> /day | Description of the object                                | Description of solution after treatment | Judgment      |
|---------------------------|------------------------------|--|---|---------------|
| Nickel free Chromic Steel | 0.66                         | light corrosion on                                       | Practically unchanged, clear            | resistant     |
| Iron                      | 58.92                        | etched   | Clear, colorless, dark brown deposit    | Not resistant |
| Iron, tinned              | 0.48                         | build-up of a mat-layer with good adhesion               | Practically unchanged, clear            | resistant     |
| Brass                     | 0.11                         | practically unchanged                                    | Practically unchanged, clear            | resistant     |
| Copper                    | 3.58                         | Not attack. Build-up of a rough layer with good adhesion | Practically unchanged, clear            | resistant     |
| Alu-composition           | 0.16                         | Darkly colored with many white spots                     | Practically unchanged, clear            | resistant     |
| Pure aluminium            | 0.80                         | Darkly colored   | Practically unchanged, clear            | resistant     |
| Wood-teak                 | - -                          | whitened Slightly more porous surface                    | Light Yellow                            | resistant     |
| Oak                       | - -                          | some yellowing   | Light Yellow                            | resistant     |
| Mahogany                  | - -                          | some yellowing   | Light Yellow                            | resistant     |
| Rubber                    | - -                          | some yellowing   | Light Yellow                            | resistant     |
| Plastics (PE-PVC etc)     | - -                          | unchanged  | unchanged                               | resistant     |

H. Hoffer Milchwirtschaftliche Berichte  
December 1995

## Applications

Sterilize 002<sup>®</sup> has outstanding characteristics which are best illustrated by the wide variety of fields where the product is an accepted germicide:

- [Intensive farming](#) (e.a. pigs, poultry, cattle)
- [Cooling tower disinfection](#)
- Milking parlors
- Veterinary practice
- [Slaughter houses, meatpackers and butcheries](#)
- [Hospitals and pharmaceutical industries](#)
- [Disinfecting washing powder](#)
- [Breweries and soft drink factories](#)
- Dairy and margarine industries
- [Ice-cream manufacturing](#)
- Biochemistry
- [Sugar and potato industries](#)
- [Food industry, including canneries](#)
- [Aquaculture](#) (e.a. trout, salmon, turbot, seabream, shrimp)
- [Water disinfection](#)
- [Personal hygiene](#)
- [Swimming pools](#)
- Drinking water
- Waste water treatment

Sterilize 002<sup>®</sup> is not only used as a disinfectant. In many other areas Sterilize 002<sup>®</sup> finds its way because of its chemical characteristics. Some of these areas are:

- Washing powder as a bleaching agent
  - Gas deodorization
  - Textile dyeing
  - Waste water deodorization
  - Radio-labeling
  - Analytical analysis
  - Textile bleaching
  - Mild oxidative reactions

## Hospital and institutional cleaning

### [Disinfection of miscellaneous rooms](#)

- [Disinfection of objects](#)
- [Faeces disinfection](#)

### Institutional cleaning

The [compatibility](#) of Sterilize 002<sup>®</sup> with virtually all materials makes it the disinfectant of choice for institutional disinfection in places such as kitchens, canteens, showers, bathrooms and lavatories.

Practically all surfaces and objects can safely be disinfected with Sterilize 002<sup>®</sup>, which is completely reliable. It can also be used in hydrotherapy and in combination with [detergents](#)

### Hospitals and homes for the elderly

Sick and old people have in common that they are more vulnerable in terms of microbial attacks. Therefore, their environment demands high standards of hygiene. There should be a heightened alertness as to the possible carry-over of micro-organisms. Vectors are people, miscellaneous surfaces, air streams, food and (drinking) water. Disinfection is one of many measures for blocking microbial dispersal. Wherever disinfection comes in, the disinfectant of choice should be bactericidal, fungicidal and virucidal. Few disinfectants will comply; Sterilize 002<sup>®</sup> is among the exceptional chemicals that are fully dependable.



## Micro biocidal activity

Gram-negative, gram-positive bacteria and viruses are a constant source of problems in these institutions. Sterilize 002<sup>®</sup> stands out as a virucidal agent, which in combination with its bactericidal reliability make it the disinfectant of choice. As Pseudomonas and specific Streptococci strains are among the most resistant bacteria, there is hardly any need for further bactericidal search. It is of interest however to see confirmed that Sterilize 002<sup>®</sup> is able to destroy notorious pathogens, such as:

## Micro organism

Escherichia Coli  
Salmonella  
Pseudomonas  
Vibrio cholerae  
Bacillus tuberculosis  
Lactic acid bacteria  
Staphylococci  
Streptococci  
Enterobacteria  
Coxsackie virus  
Hepatitis B virus  
HIV virus  
Polio virus  
Human rotavirus



### 1. floors

Floors are mopped (use a clean mop and bucket) with a 0.3 - 0.5% solution of Sterilize 002<sup>®</sup>.

### 2. walls, bedsteads, bedside lockers, door handles etc.

These surfaces are preferably damp wiped in order to prevent the spreading of dust. The water used is a 0.3 - 0.5% solution of Sterilize 002<sup>®</sup>.

### 3. washing stands

These wet areas are often a source of Pseudomonas spec. They should be cleaned and disinfected twice a day (0.3 - 0.5% Sterilize 002<sup>®</sup>). Do not use soap bars/tablets but liquid soap so as to avoid the transfer of [micro-organisms](#).

### 4. showers, bath-rooms, lavatories

After taking a (shower)bath people tend to disperse more micro-organisms than usually. Therefore, after each use of the bath or shower the area concerned should be disinfected (0.3% - 0.5%). This applies to the floor as well, especially for the prevention of "athlete's foot". Toilets should be disinfected a few times a day. Special attention is to be paid to the seat, the flush handle, tap and door handles (0.3 - 0.5%).

### 5. kitchens and canteens

Kitchens need special attention as a potential source of contamination. Generally, all surfaces should be disinfected with 0.3 - 0.5% Sterilize 002<sup>®</sup>, this includes refrigerators. Trolleys must be cleaned and disinfected (0.3 - 0.5%) on leaving and entering the kitchen. International regulations prescribe that surfaces coming into contact with food or drinking water must be rinsed with clear water after the use of detergents or disinfectants. Sterilize 002<sup>®</sup> rinses off easily and leaves no residues because of its excellent water solubility.

### 6. Hydrotherapy

The water containers should have a constant concentration of at least 200 g Sterilize 002<sup>®</sup> per m<sup>3</sup>.

## Disinfection of objects

### 1. rubber sheeting, rings, bowls for cotton wool etc.

After each cleaning operation disinfection should follow (0.3 - 0.5%).

### 2. urinals, bedpans

Fill these before use with 200 ml of water, in which there is 1 g of Sterilize 002<sup>®</sup>. This will additionally reduce

the spread of unpleasant odorous. Never place these right on the floor but on a disposable plastic sheet or bag.

### **3. sputum mugs**

Use disposable types that can be burnt. In case of spilling a 5% solution should be allowed to act for an hour.

### **4. brushes, mops and other cleaning material**

These are always highly contaminated. After use they are placed in a 0.1% solution in which they are kept overnight.

### **5. barbers' utensils**

Every male patient should have his own shaving equipment and shaving cream. Combs and scissors must be thoroughly rinsed with a 0.3 - 0.5% solution before any patient is treated.

### **6. reading matter**

Fatty spots may retain [micro-organisms](#). Magazines and the like are therefore preferably provided with a washable plastic cover (disinfection 0.3 - 0.5%).

### **7. ear plugs**

Use plastic covers which are disposed of after a patient's dismissal.

### **8. flowers**

Vase water presents a high risk (esp. *Pseudomonas spec.*). Apply 0.1% Sterilize 002<sup>®</sup>. Dip vases after use in a 0.3 - 0.5% solution.

### **9. thermometers**

Wipe with cotton wool (0.3 - 0.5%) and store in a 0.3 - 0.5% solution Sterilize 002<sup>®</sup>.

In children's departments and psychiatric homes the thermometers are preferably kept dry (risk of drinking). In that case the thermometer is to be treated once more just before use.

### **10. sluices**

In kitchens for babyfood the outside of tins, bottles should be disinfected; crown corks, if any, should likewise be treated.

Disinfection takes place by means of immersion (0.3 - 0.5%).

### **11. humidifiers**

This apparatus can disperse e.g. *Pseudomonas aeruginosa*. Therefore, they must be disinfected (0.3 - 0.5%) regularly. The water to be vaporated should contain 0.001% Sterilize 002<sup>®</sup>.

### **12. cutlery, crockery etc.**

No manual cleaning; machine cleaned items can be regarded as safe. Drying must take place fast and likewise by means of a machine. Use 0.1% Sterilize 002<sup>®</sup> in the pre-final rinse.

## **Faeces disinfection**

### **1. faeces**

from infection departments or from patients with intestinal difficulties must be disinfected prior to drainage via the sewer.

Double the volume of a 2% Sterilize 002<sup>®</sup> solution must be used to the amount of faeces/urine. This solution should act for about 1 hour. In case of tuberculosis a 0.5% solution must be used for contaminated, soiled linen which solution must act for 12 hours.

3 g per 1 l of water for 12 hours are recommended for soaking soiled linen without the risk of tuberculosis.

### **2. napkins**

Preferably paper napkins are to be used.

Stocked soiled diapers may present the risk of microbial growth and may spread unpleasant smells. For this purpose 0.3 - 0.5% Sterilize 002<sup>®</sup> is recommended.

Nurses are never to handle soiled diapers.

### **3. sheepskins and artificial skins (bed puffs)**

In case of bed-sore patients these bed puffs can be treated effectively with a 0.3% rinse for 10 minutes.

### **4. mattresses and pillows**

Use synthetic, autoclavable types.

Foam rubber mattresses can be sprayed in a vertical position (0.3 - 0.5%); they have to dry to the air.



## 5. laundry trolleys

These must both be cleaned and disinfected (0.3 - 0.5%) on entering on leaving the departments.

## 6. blood or pus

All cleaning operations must be wet. They must be followed by disinfection (0.3 - 0.5%). When blood or pus is spilt the place concerned must be cleaned with tissue matter drenched in a 2% solution. Another bung of tissue matter (2%) must be allowed to leave on the spot for about 20 minutes.

## Cooling tower disinfection

"The legionellose disease is mainly caused by Legionella pneumophila (responsible for more than 80% of the infections). It causes very serious pulmonary infections, fatal in about 15-20% of the cases.

Legionella is a Gram negative bacteria found in water systems and proliferating when temperature is between 20 and 45°C. Cooling towers, air conditioning systems, Jacuzzi etc... are places often contaminated. The water aerosol (very fine water droplets) created by these equipments can disperse the bacteria and when inhaled by people, are responsible for the infection.

In order to avoid any problem, it is of major importance to regularly maintain and disinfect equipment where Legionella can be present. Together with hygiene management, a reliable and safe disinfectant is needed.

Independently tested according to the European norm NF EN 1276, Sterilize 002® proved to be very effective against Legionella pneumophila. (IRM, France, 2001)

Because it is also safe for the user, non-corrosive for the material and very stable, Sterilize 002® already proved to be very useful for disinfection of cooling towers.

Application: a 0.1-0.3% Sterilize 002® solution should be used to regularly disinfect the system. A 500 ppm (0.05%) solution can be used for regular maintenance during operation.

## Food and beverages

- [Handling](#)
- [Dosage](#)

The risk of microbial contamination exists wherever food and beverages are handled. In addition to reducing product appeal, this also poses a potential hazard for human health. A product may not be consumed until long after it has been contaminated. During this interval the number of pathogenic germs may increase dramatically.

## Micro biocidal activity

Yeasts, fungi, Gram-negative and Gram-positive bacteria are a constant source of problems in most industries. Though Sterilize 002® stands out as a virucidal agent, it is its bactericidal and fungicidal reliability that counts in Food & Beverage industry. As Pseudomonas and specific Streptococci strains are among the most resistant bacteria, there is hardly any need for further bactericidal search. It is of interest however to see confirmed that Sterilize 002® is able to destroy notorious pathogens, such as:

Pseudomonas

**Salmonella**

**Campylobacter**

Clostridium

Colibacteria (a.o E.coli O157:H7)

Staphylococci

Streptococci

Proteusbacteria

Lactic acid bacteria

Listeria

Candida Albicans

Trichophyton mentagrophytus

Vibrio spp.



Achromobacter bacteria  
 Brucella bacteria  
 Alcaligenes bacteria  
 Enterobacteria  
 Mycobacteria  
 Klebsiella bacteria  
**Yersinia bacteria**  
 Saccharomyces cerevisiae  
 Aspergillus  
 Coxsackie virus

A particularly striking feature is the prolonged activity of Sterilize 002® in aqueous systems without building up resistant strains of microbes. A low concentration in rubber hoses or other flexible tubing systems is sufficient to prevent microbial growth during longer periods, such as weekends without effecting the flexibility of the tubing.

**Aquaculture**

As with any other type of intensive farming, proper housekeeping is an absolute necessity in aquaculture. Stringent cleaning and disinfection procedures are necessary to prevent disease problems resulting from the uncontrolled growth of bacteria, viruses or fungi.

Sterilize 002® can be used at all stages of fish and shrimp farming. It is suitable for the general disinfection of passage bath tanks, pond surfaces and equipment, water pre-conditioning (15 mg/l), in which water is treated before stocking, and 'water quality maintenance (in which water is treated after stocking), and disinfecting eggs and artemia'.

Sterilize 002® is used in major European trout farming countries to prevent and cure bacterial gill disease. A similar application in salmon hatching is carried out under the supervision of the U.S. Fish and Wildlife Service.

| Hatchery                              | Nursery                               | Growout farm                          | Processing level              |
|---------------------------------------|---------------------------------------|---------------------------------------|-------------------------------|
| <b>Water</b><br>Water preconditioning | <b>Water</b><br>Water preconditioning | <b>Pond</b><br>Pond surface           | <b>Utilities</b><br>Equipment |
| <b>Facility</b><br>Tanks              | <b>Facility</b><br>Tanks              | <b>Utilities</b><br>Equipment         | <b>Product</b>                |
| <b>Utilities</b><br>Equipment         | <b>Utilities</b><br>Equipment         | <b>Water</b><br>Water preconditioning |                               |
|                                       | Water quality maintenance             | Water quality maintenance             |                               |
| <b>Eggs</b>                           |                                       | <b>Post-larvae</b>                    |                               |
| <b>Feed/Artemia</b>                   | <b>Feed/Artemia</b>                   | <b>Feed/Artemia</b>                   |                               |

Surface disinfection is carried out after thorough cleaning. In many countries there is a tradition to combine cleaning and disinfection. Sterilize 002® can likewise be dissolved in a solution of a -preferably neutral-detergent (pH between 6-8). It should be borne in mind that most of the times a one-step treatment is only partially successful. Best results are attained if "dirt" (interfering proteins and encapsulating fatty matter) is



first removed so that the disinfectant is able to have an optimum contact with the micro-organisms still clinging to the surfaces thus treated.

Sterilize 002<sup>®</sup> can be rinsed, brushed, mopped or sprayed. Spraying devices should use a pressure below 6-10 bar to produce coarse droplets. This avoids the risk of inhalation and promotes a proper distribution of the active solution. Non-porous surfaces require at least 150 ml of fluid per m<sup>2</sup>. Higher temperatures of the disinfecting solution are only useful if the materials to be treated are allowed to adopt these temperatures themselves (e.g. in laundering). Allow the treated surface to dry to the air.

To obtain the optimal surface disinfection results, the surfaces should be almost, but not completely dry at the moment the disinfection operation starts. If the surfaces are too wet instant dilution (lower activity) will occur. If the surfaces are completely dry you need more Sterilize 002<sup>®</sup> solution than strictly required. Allow the treated surface to dry to the air. Disinfection is completed unseen. Unlike cleaning, its effect cannot be checked visually. Therefore you need a methodical approach to ensure the best results.

Sterilize 002<sup>®</sup> is always used in aqueous solutions which are prepared by dissolving the powder in water. Sterilize 002<sup>®</sup> is a mild product without any immediate harmful effect on the human skin, the eyes or clothes, but it should not be inhaled or allowed to act on the skin for many hours at a stretch. A dust mask is recommended when a solution is prepared. In case of skin contact the skin section exposed must be washed with water and soap.

Sterilize 002<sup>®</sup> itself does not produce foam, but it can very well be used in foaming devices for marking off the surfaces that have to be disinfected. For vertical surfaces using a foam containing Sterilize 002<sup>®</sup> adds to the efficacy of the disinfectant solution.

## Disinfection procedure

Water disinfection is done to bring or keep the microbial quality of the water to a certain desired level, by simply adding Sterilize 002<sup>®</sup> to the water in the required amount. This is the application where Sterilize 002<sup>®</sup> shows one of its unique properties: the simple applications and the broad range activity combined with the [low toxicity](#) of Sterilize 002<sup>®</sup> to fish and shrimps. This means Sterilize 002<sup>®</sup> can be used both for water pre-conditioning and water quality maintenance. This is the best prerequisite to grow strong and healthy animals in each stage, resulting in reduced mortalities and increased profits.

The toxicity of Sterilize 002<sup>®</sup> to the following species relevant to fish and shrimp farming has been established in tests:

|  |         |      |      |      |
|--|---------|------|------|------|
| Daphnia Magna (water-flea)                                     | 48-hour | NOEC | 1.8  | mg/l |
|  | 21-day  | NOEC | 1.1  | mg/l |
| Poecilia reticulata (Guppy)                                    | 96-hour | NOEC | 1.2  | mg/l |
| Pimephales promelas (Fathead minnow)                           | 35-day  | NOEC | 1.5  | mg/l |
|  | 96-hour | LC50 | 7.3  | mg/l |
| Salmo gairdneri (rainbow trout)                                | 96-hour | LC50 | 2.8  | mg/l |
| Ictalurus punctatus (Channel Catfish)                          | 96-hour | LC50 | 3.8  | mg/l |
| Penaeus setiferus (Gulf white shrimp)<br>(mysis stage)         | 24-hour | LC50 | 20.  | mg/l |
|  | 72-hour | NOEC | 10.  | mg/l |
| Penaeus monodon (Giant tiger shrimp)<br>Post-larvae (30-50 mm) | 24-hour | LC50 | 100. | mg/l |
| Artemia (Brine shrimp) (nauplii)                               | 72-hour | NOEC | 10.  | mg/l |
|  | 72-hour | EC50 | 25.  | mg/l |



## Avian Influenza (Bird Flu Virus)

Outbreaks of Highly Pathogenic Avian Influenza (HPAI) proved to be devastating for the poultry industry. Severe avian influenza epidemics, such as in the Netherlands in 2003 and Asia this year, require the culling of millions of birds and cost millions of Euros.

Proper hygiene management is thus of major importance to avoid contamination. This includes general cleaning and disinfection protocols, together with a safe and reliable disinfectant. In case of an outbreak, reactivity is important. Culling of the birds is generally needed, followed by quarantine measures and proper disinfection of the building and equipment.

Independently tested, Sterilize 002® proved to be very effective against the avian influenza virus, at a concentration as low as 0.1%, even with a high level of soiling.

The suspension efficacy test was performed at 10°C with high level of organic soiling (1% bovine albumin + 1% yeast extract) and a contact time of 30 min. A 1,000,000 killing factor (i.e. log 6 reduction of the virus titre) was achieved under these conditions, when the required norm is usually of 10,000 or 100,000 (log 4 or 5).

Hence the use of Sterilize 002® ensures you a maximum efficacy in terms of virus eradication. Because it is effective, but also safe to use, non corrosive for your equipment and versatile, Sterilize 002® is the disinfectant of choice against avian influenza.

Please refer to the [Intensive farming application](#) for further details

## Intensive farming

### [Hygiene: disinfection & cleaning](#)

- [Eggs](#)
- [Shoe-wear passages, fodder area, lorries](#)
- [Application/concentration table](#)

Any space meant for the accommodation of animals, whether sheds, pens, cages, baskets or means of conveyance, presents a health hazard to new arrivals if it has not been properly cleaned & disinfected. In particular, young animals under stress are prone to infection when exposed to high counts of micro-organisms.

At the same time, residues from traditional disinfectants can also pose a danger, affecting well-being and growth due to the complications and resultant stress they often cause.

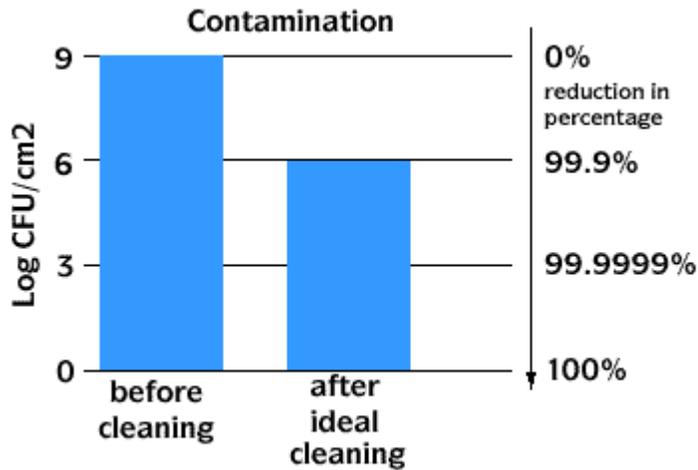
The [safety](#) of Sterilize 002® in this respect is well known

It leaves no harmful residues and has no effect on animals, so they can enter immediately after cleaning & disinfection. In addition, Sterilize 002® remains fully active at low application temperatures and is safe for rubber and plastics, making it the ideal disinfectant in milking equipment.

### Hygiene: disinfection & cleaning

The microbiocidal efficacy of Sterilize 002® is very much dependant on two issues:

1. The absolute degree of contamination in the animal house. Here you find the bacterial count per cm<sup>2</sup> of concrete floors of animal houses. Even after the most effective cleaning (99.9 % reduction !) the floor still harbours over a million bacteria/fungi per cm<sup>2</sup>. This illustrates also that a disinfectant claimed to kill 99.9 % - however impressive this sounds - is not considered sufficient. The European minimum kill for a disinfectant is a reduction in bacterial count of 100,000 (99,999 % !) AFTER CLEANING.  
(The testconditions are described by CEN)



2. The relative predominance of the various micro organisms on concrete floors in animal houses.

| Strains         | Percentage |
|-----------------|------------|
| Staphylococci   | 90.8       |
| Streptococci    | 8.6        |
| Enterobacteria  | 0.2        |
| Pseudomonas sp. | 0.2        |
| fungi/yeast     | 0.1        |
| bacteria spores | 0.1        |

This calls for an efficacious disinfectant that is able to effectively reduce the microbial count down to low, hygienically acceptable numbers, even in the presence of a high load of organic matter. However the gross organic matter should be removed before disinfection, since there is no disinfectant available that can penetrate into thick layers and destroy encrusted micro organisms.

Sterilize 002<sup>®</sup> easily kills the most predominant bacteria, Staphylococci, but also the most resistant ones, such as Pseudomonas and Streptococci. It has been established over and over that Sterilize 002<sup>®</sup> also kills other notorious pathogens such as:

**Bacteria**

- Salmonella
- Colibacteria
- Proteus bacteria
- Lactic Acid bacteria
- Achromobacter bacteria
- Brucella bacteria
- Alcoligenes bacteria
- Enterobacteria
- Mycobacteria
- Klebsiella bacteria
- Yersinia bacteria

**More micro organisms**

Sterilize 002<sup>®</sup> shows its strength. 10% Formaline is not able to sufficiently reduce Staphylococci and Streptococci at low temperatures e.g. at 4 °C. Considering the predominance of these strains in animal houses, formalin can not be chosen as Universal Desinfectant like Sterilize 002<sup>®</sup>.

**Virucidal activity**



Where most disinfectants show the ability to control bacteria in animal houses, only the universal products remain when inactivation of viruses comes in view. The naked viruses are extremely resistant, far more than the most resistant bacteria. There are few classes of disinfectants that have the potency to destroy the naked viruses. Sterilize 002<sup>®</sup> is among them in the company of aldehydes and hydroxides. In international testing schemes, Sterilize 002<sup>®</sup> has shown to inactivate both enveloped and naked viruses, in the presence of organic matter, at low temperatures and very speedily at that. Following viruses have been tested:

### **Virus**

- Classical/European Swine fever
- African Swine Fever
- Aujeszky Disease Viruses
- Foot and Mouth Disease Viruses
- Vesicular Swine Disease Viruses
- Newcastle Disease Viruses
- Infectious Bronchitis Viruses
- Infectious Bursitis Viruses (Gumboro)
- Avian Viruses
- Cello Viruses
- Myxomatosis Viruses
- Porcine Parvo Virus
- Canine Parvo Viruses
- ECBO Viruses
- Coxsacki Viruses
- Hepatitis B Viruses
- HIV (AIDS) Viruses
- Vaccinia (Orthopox Commune Viruses)

### **General**

Sterilize 002<sup>®</sup> being a universal disinfectant dissolves readily in water and can be rinsed, sprayed or nebulized without any difficulty. After disinfection, the animal house can be entered at once.

### **Handling and dosing**

When you are going to disinfect, see to it that the surfaces are almost, but not completely dry at the moment the disinfection operation starts. If the surfaces are too wet instant dilution will occur. If the surfaces are too dry you need more Sterilize 002<sup>®</sup> solution than necessary. Allow the solution to dry to the air. Disinfection is completed unseen. Unlike cleaning, its effect cannot be checked visually. Therefore you need a methodical approach to ensure the best results.

Sterilize 002<sup>®</sup> is always used in aqueous solutions which are prepared by dissolving the powder in water. Sterilize 002<sup>®</sup> is a mild material without any immediate effect on the human skin, the eyes or clothes, but it should not be inhaled or allowed to act on the skin for many hours at a stretch. A dust mask is recommended when a solution is prepared. In case of skin contact the skin section exposed must be washed with water and soap.

Sterilize 002<sup>®</sup> itself does not produce foam, but it can very well be used in foaming devices for marking off the surfaces that have to be disinfected. For vertical surfaces using a **foam** containing Sterilize 002<sup>®</sup> adds to the efficacy of the disinfectant solution.

The solution can be rinsed, brushed, mopped or sprayed. Spraying devices should use a pressure below 6-10 bar to produce coarse droplets. This avoids the risk of inhalation and promotes the proper distribution of the active solution.



Sterilize 002<sup>®</sup> is always applied in aqueous [solutions](#) which are prepared by dissolving the powder in water.

Sterilize 002<sup>®</sup> is a mild material without any immediate effect on the human skin, the eyes or clothes.

However, it should not be inhaled or allowed to act on the skin for hours at a stretch. In case of skin contact the area exposed must be washed with water and soap. Stock solutions of 5% are to be kept in dark, well-closed polyethylene bottles/cans. For exact dosing sachets of 50 g are available. Regular packages are plastic pails of 20, 10, and 5 kgs. For industrial consumers 25 kg and 1000 kg bags are available.

## Eggs

### Disinfection of hatchery eggs

Prevention of the spread of diseases is a major concern to every farmer. In order to prevent cross-contamination from the laying houses to the breeding rooms, disinfection of the eggs as well as the transport equipment is of utmost importance.

### Disinfection of equipment

The equipment needs to be cleaned and rinsed before disinfection. Disinfection is done by spraying with or dipping in a 0.3 % Sterilize 002<sup>®</sup> solution. Allow the equipment to dry in the air. This will prolong the disinfection effect.

### Disinfection of hatchery eggs

The sequence for disinfection of hatchery eggs is also: cleaning, rinsing, disinfection and drying. In order to prevent adsorption of the cleaning solution, the water or the disinfectant solution by the egg shell, the temperature in each step must be a few C higher than in the previous step. The following approach can be used:

- Wash the eggs with a detergent.  
The temperature of the detergent solution should be about 30 °C.  
Rinse the eggs with clean water (drinking water quality) at about 35 °C.  
Then dip the eggs for 3 minutes in a 0.3 % Sterilize 002<sup>®</sup> solution at about 40 °C.  
Dry the eggs as soon as possible afterwards.
- The disinfected eggs can be transported to the disinfected breeding rooms on disinfected trays. This sequential cleaning and disinfection program will significantly decrease chick mortality.
- For disinfection of consumption eggs more or less the same approach can be used. However in Holland it is not authorized to disinfect consumption eggs.

December 1995

## Shoe wear, passages, fodder area & lorries

### Visitors

Shoe-wear may be responsible for the carry-over of micro-organisms that are not common to the animals accommodated. Visitors like veterinarians, consultants or salesmen could introduce micro-organisms which are detrimental to your animals. To prevent this the shoe-wear must be disinfected. The best way to do so is to make flat-soled boots available that have stood in a clean Sterilize 002<sup>®</sup> solution. The boots need to be clean before they are put back into the solution. The Sterilize 002<sup>®</sup> solution must be changed every week.

### Personnel

For personnel pails can be used in which boots are immersed in passing. Since this solution gets soiled and the time of exposure is relatively short, a stronger solution must be used and the Sterilize 002<sup>®</sup> solution should be changed every day.



### Passages, fodder area

Passages and the fodder-area need [cleaning & disinfection](#) too. Care must be taken that dust is a potential contaminant and therefore needs to be removed regularly.

### Lorries

Vehicles conveying animals are likely to get heavily contaminated and need to be disinfected too.

### **Application/concentration table**

| <b>Application area</b> | <b>Advised concentration</b> | <b>Remarks</b>   |
|-------------------------|------------------------------|--|
| Animal houses only      | 5 gram/liter                 | bacteria only  |
|                         | 10 gram/liter                | bacteria, viruses, funghi                              |
|                         | 20 gram/liter                | weekly disinfection, bacteria, fungi and viruses       |
|                         | 30 gram/liter                | time interval between disinfections longer than 1 week |
| Eggs                    | 4 gram/liter                 |  |
| Lorries                 | 20 gram/liter                |  |
| Passages/fodder area    | 0 gram/liter                 | weekly disinfection, bacteria only                     |
|                         | 20 gram/liter                | weekly disinfection, bacteria, fungi and viruses       |
| Shoe wear               | 10 gram/liter                | constant immersion bath                                |
|                         | 20 gram/liter                | passage bath   |
| Small items             | 10 gram/liter                | immerse for at least one hour                          |

For floors about 400 ml/m<sup>2</sup> solution is needed. For walls and ceilings about 140 ml/m<sup>2</sup> will suffice. On average 250 ml/m<sup>2</sup> is needed for disinfecting a whole animal house.

