# *TH4+*

*3rd Generation Synergistic Disinfectant*

# CONTENTS

# Introduction :

SOGEVAL : *"Prevention does not cost, it pays !"*

Since its establishment in 1978, SOGEVAL has constantly been searching for innovative solutions to improve disease prevention and hygiene in livestock industry, together with a high regard for safety and environmental concerns.

Our first products were iodine based (TH3 IODINE), but we soon realized the limits of such preparations : their optimum pH of activity is below 6. This is out of the normal farm pH which is usually between 7 and 9.

Phenolics were not considered, due to their toxicity, their very low biodegradability and their lack of activity on naked viruses.

Two families of biocides were considered : aldehydes and QACs. This gave birth to our first Synergistic disinfectant : TH3 80, an association of BKC, Glutaraldehyde, Formaldehyde and Glyoxal.

It performed a then univalled activity covering the whole spectrum of microorganisms from Naked Viruses to Bacteria, Fungi and Mycoplasma. Then, out of concern for Formaline's toxicity, we opted for Glutaraldehyde as the only source of aldehyde and developed TH2 (15% Glutaraldehyde, 10% BKC). It performed as well as the former (TH3 80) but without Formaline. However, there was still room for improvement : recent developments in QACs technology led us to use a more performant blend of 4 Quaternary Ammonium Chlorides rather than the good old BKC. It allowed us to reach higher levels of activity while reducing the level of Glutaraldehyde in the formula, thus improving further the friendly smell of our disinfectants: this is how was born TH4+, the 3rd generation synergistic disinfectant in 1988.

Today, our R&D team keeps on working on new formulas that will help improve the disease control in livestock farmers throughout the world, in accordance with the customer's requirements for a high quality meat and with environmental protection standards.

# A- General properties of TH4+

### *1- **COMPOSITION : A PATENTED FORMULA***

- Glutaraldehyde : 6,25%

  CHO - CH2 - CH2 - CHO

- Quaternary ammonium synergistic blend : 12,50%

  - Didecy Dimethyl Ammonium Chloride
  - Octyldecyl Dimethyl Ammonium Chloride
  - Dioctyl Dimethyl Ammonium Chloride
  - N Alkyl Dimethyl Benzyl Ammonium Chloride ($C_{12}$ : 40%, $C_{14}$ : 50%, $C_6$ : 10%)

- Terpine derivatives : 4%

  Pine oil and terpineol.

### *2- **APPEARANCE***

Pure TH4+ is a transparent green liquid.

### *3- **ODOUR***

Characteristic - Pine terpine smell.

### *4- **STABILITY***

Tested for 5 years - no drop in efficacy.

Shelf life = 24 months.

Stable up to 90°C.

### *5- **SOLUBILITY***

Total in water at all temperatures.

### *6- **SPECIFIC GRAVITY***

S.G. : @ 20°C  1.0 kg/litre.

### *7- **pH***

- Pure TH4+ : 3,85 (+/- 0,2)
- 1:200 solution : 4,70 (+/-0,2)

### *8- **CORROSIVITY***

Materials tested with no corrosive effect : mild steel, zinc, copper, brass, tin, stainless steel, aluminium, rubber.
Materials to avoid : nylon, oxidising agents.

# B - Toxicity

## *1- ACUTE TOXICITY*

Oral $LD_{50}$ of pure TH4+ in rats is : - Male : 3 000 mg/kg

- Female : 3 300 mg/kg

Note : oral $LD_{50}$ of salt (NaCl) is 1 000 mg / kg.

## *2- LOCAL TOLERANCE*

2.1 - Skin tolerance

Skin tolerance has been tested in rabbits according to AFNOR norm NF T03-263. It has resulted that pure TH4+ is rated as "slightly irritating for skin".

2.2 - Eye tolerance

Eye tolerance has been tested in rabbits according to AFNOR NF T03-264 standard. Pure TH4+ is highly irritating for the eye in spite of ocular rinsing performed one minute after instillation.

## *3- MUTAGENICITY, CARCINOGENICITY*

Standard AMES test not valid due to high antibacterial activity. None of TH4+'s components is known as having mutagenic nor carcinogenic effects.

## *4- BIODEGRADABILITY*

Conforms to EEC directive 73/405 (over 90% degraded over 14 days).

TH4+ contains no phenolic compound.

# C- TH4+ Mode of action

### *1- **GLUTARALDEHYDE** :* HYDROPHILIC DE-ACTIVATION

Glutaraldehyde has the property to bind itself to the proteins through their R-NH2 (amine) groups. It has a very strong virucidal activity obtained by the cross-linking of the proteins of the naked (or hydrophilic) viruses' capsid. It also combines with the nucleic acids contained in viruses (DNA/RNA). Bactericidal and fungicidal activities are due to the combination of glutaraldehyde with the proteic parts of the metabolic enzymes, and with the amino-acids.

Being strictly hydrophilic, glutaraldehyde cannot cross the cell's lipidic membrane nor the coating of lipophilic viruses. Therefore it can only act outside these micro-organisms and has consequently a rather slow action.

TH4+'s exclusive formula allows glutaraldehyde to kill germs from the inside thanks to the association with a synergistic blend of highly tensio-active QAC's.

### *2- **QAC's**[1] :* LIPOPHILIC DE-ACTIVATION

QAC's are cationic tensio-active agents. At low concentrations they have cidal properties on a wide spectrum of micro-organisms (Gram+ & Gram- bacteria, fungi, viruses).

Their major site of action is the cell membrane, where they create a dissolution of phospholipiodes (cholesterol membranes) and cause changes in permeability that allow the escape of cell constituents and cause cell disorientation.

These changes in permeability also allow glutaraldehyde to penetrate inside the microorganisms.

### *3- **TERPINE DERIVATIVES***

These components have a light disinfecting property. Moreover :

- Terpineol is an effective insect repellent (insects are potential vectors of microorganisms).
- Pine oil, thanks to its "stickyness" allows the final solution of TH4+ to stay longer on vertical surfaces. It also evaporates very slowly and increases the remanence of TH4+.

***TH4+ : A truly synergistic mode of action .***

1 : *Quaternary Ammonium Chlorides*

# D- Fields of application of TH4+

***1- <u>ANIMALS DISEASE CONTROL</u>***

PIG BREEDING

- Breeders
- Farrowing pens
- Fattening units

POULTRY BREEDING

- Breeders
- Layers
- Broilers
- Hatcheries

DAIRY CATTLE

PET CLINICS

***2- <u>FOOD HYGIENE</u>***

Slaughterhouses

Cold storage

Grain storage

Food & feed transportation lorries

Restaurants

***3- <u>HOSPITALS</u>***

# E- How to use TH4+ ?

### *1- SPRAYING (Terminal & routine disinfection)*

- No specific disease :

Use TH4+ at the dilution rate of 1:200.

- Specific disease outbreak :

| Disease due to : | Use TH4+ at the dilution of: |
|---|---|
| Picornavirus, Parvovirus | 1:50 |
| Adenovirus, Poliovirus | 1:100 |
| Other viruses, bacteria, fungi | 1:200 |

### *2- DIPPING (Foot-bath, Wheel-bath)*

- No specific disease :

Fill the baths with a 1:100 TH4+ solution. Change solution when dirty or at least every week.

- Specific disease outbreak :

Fill the baths with a 1:50 TH4+ solution. Change solution every 2/3 days, or sooner if high soilage.

### *3- MISTING*

Spraying a fine disinfectant mist over animals can reduce cross infection during outbreaks of respiratory or other diseases.

Apply a very fine mist of TH4+ 2 to 4 times daily over stock.

Apply sufficient to fill the atmosphere with a very fine mist. Approximately 1 litre of 1:200 solution per 100 cubic meters of airspace is required. (Use a mechanical or plumbed in fogging system or a pressure washer delivering a very fine mist).

### *4- THERMOFOGGING (Terminal disinfection)*

Use a branded thermofogger, that will create a fog of very fine droplets (a few microns wide).

Feed the thermofogger with a 1:1 solution of TH4+ (eg. 50%).

It requires 5 ml of 1:1 solution to fumigate 1 cubic metre.

# F - TH4+ Virucidal activity chart

| Viruses families | Poultry | Cattle | Pigs | Horses | Pets | Dilution |
|---|---|---|---|---|---|---|
| Adenovirus (DNA) Naked | - Avian adeno virus<br>- EDS 76<br>- Haemorragic enteritis virus<br>-Quail bronchitis | - Bovine adeno virus | - Porcine adenovirus | - Equine adeno virus | - Rubarth<br>- Laryngo-tracheitis | 1:100 |
| Coronavirus (RNA) coated | - Avian IB<br>- Blue comb disease (turkey) | - Neonatal calf diarrhea | - TGE<br>- Vomiting & wasting disease<br>- Hemagglutinating encephalomyelitis<br>- Porcine epidemic diarrhea | - Enteritis | - F.I.P. | 1:2000 |
| Herpetovirus (DNA) coated | - Mareks<br>- Infectious Laryngo Tracheitis<br>- Duck plague | - IBR<br>- Bovine herpes<br>- Epstein Barr | - Aujeszky<br>- Inclusion body rhinotracheitis<br>- Porcine cytomegalo virus | - Equine rhinopneumonia<br>- Viral keratitis<br>- Coïtal exanthema | - Feline coryza | 1:5000 |
| Iridovirus (DNA) Naked | | | - African swine fever | | | 1:200 |
| Retrovirus (RNA) coated | - Avian leukosis<br>- Rous sarcoma<br>- Reticulo endotheliosis | - Leukosis<br>- Sarcoma<br>- Bovine syncitial | | -Infections Anæmia | - Feline leukosis | 1:200 |
| Orthomyxovirus (RNA) coated | - Avian influenza<br>- Fowl plague | - Influenza | - Swine influenza | - Influenza | | 1:200 |
| Papovavirus (DNA) Naked | | - Bovine papillomatosis | | | | 1:200 |
| Paramyxovirus (RNA) coated | - Avian PMV<br>- ND(1) | - Rinderpest | | | - Distemper<br>- Hard pad | 1:1000 |
| Parvovirus (DNA) Naked | - Chicken anaemia<br>- DERSZY | - Calf enteritis | - Porcine parvovirus (reproduction disorders). | | - Canine parvovirus (1)<br>- Feline panleucopenia | 1:50 |
| Picornavirus (RNA) Naked | - Duck virus hepatitis<br>- Infectious avian encephalomyelitis (epidemic tremor) | - FMD<br>- Bovine enterovirus | - FMD<br>-Teschen-Talfan<br>- Swine vesicular disease<br>- SMEDI<br>-Porcine enterovirus infection<br>- Encephalo-myocarditis | - Equine rhinovirus | | 1:50 |
| Poxvirus (DNA) coated | - Avian pox | - Cow pox<br>- Lumpy skin disease | - Swine pox | - Horse pox | | 1:500 |
| Reovirus (RNA) Naked | - Runting & stunting<br>- Avian diarrhea<br>- Tenosynovitis<br>- Viral arthritis<br>- Duck rotavirus | - Rotavirus of calves (1)<br>- Ibaraki | - Porcine rotavirus (diarrhea)<br>- Reovirus infection | - African horse sickness<br>- Equine encephalosis | - Kennel cough | 1:1000 |
| Rhabdovirus (RNA) coated | | - Rabies<br>- Vesicular stomatitis<br>- Ephemeral fever | - Rabies<br>- Vesicular stomatitis<br>- Hemorragic septicemia | - Rabies | - Rabies | 1:200 |
| Togavirus (RNA) coated | | - Bovine viral diarrhea | - Classical swine fever (Hog cholera)<br>- Japanese encephalitis | - Arteritis<br>- Encepha-litis | | 1:2000 |
| Unclassified, RNA, Naked | - IBD | | | | | 1:200 |

# G- TH4+ Bactericidal activity chart

## *1- GRAM+VE BACTERIA*

| | Poultry | Swine | Cattle | Dilution |
|---|---|---|---|---|
| Bacillus anthracis (Gram+, sporulated) | | -Anthrax | -Anthrax | 1:200 |
| Clostridium spp (Gram +, sporulated) | | -Necrotic enteritis | | 1:200 |
| Corynebacterium spp (Gram +) | | | -Mastitis<br>-Suppurative diseases | 1:200 |
| Erysipelothrix (Gram +) | | -Erysipelas | | 1:200 |
| Listeria monocytogenes (Gram +) | | | | 1:400 |
| Staphyllococcus spp (Gram +) | -Staphyllococcosis | -Meningitis<br>-Arthritis<br>-Mastitis<br>-Suppurative diseases | -Mastitis<br>-Suppurative diseases | 1:400 |
| Streptococcus spp (Gram +) | | -Meningitis<br>-Arthritis<br>-Mastitis<br>-Suppurative diseases | -Mastitis<br>-Suppurative diseases | 1:200 |

## *2- GRAM-VE BACTERIA*

| | | | | |
|---|---|---|---|---|
| Bordetella bronchiseptica | | -Atrophic rhinitis | | 1:200 |
| E. coli | -Colibacillosis | -Colibacillosis<br>-Bowel edema | -Colibacillosis | 1:200 |
| Haemophilus spp | -Infectious coryza | -Pneumonia<br>-Pleuro-pneumonia | | 1:200 |
| Klebsiella spp | | -Mastitis<br>-Suppurative diseases<br>-Rhinitis | -Mastitis<br>-Suppurative diseases | 1:200 |
| Pasteurella spp | | -Pneumonia<br>-Atrophic rhinitis<br>-Pasteurellosis | -Pneumonia | 1:200 |
| Proteus spp | | -Suppurative diseases | -Suppurative diseases | 1:200 |
| Pseudomonas aeruginosa | | -Cystitis<br>-Pyelonephritis | -Mastitis<br>-Suppurative diseases | 1:200 |
| Salmonella spp | -Salmonellosis | -Salmonellosis | -Salmonellosis | 1:200 |

## *3- OTHERS*

| | | | | |
|---|---|---|---|---|
| Leptospira spp | | -Leptospirosis | -Leptospirosis | 1:100 000 |
| Mycoplasma spp | -CRD | -Swine enzootic pneumonia<br>-Arthritis | | 1:500 |
| Rickettsia spp | | | - Q fever<br>- Anaplasmosis | 1:200 |
| Chlamydia spp | Psittacosis | | | 1:200 |

SUMMARY

# TH4+
# THE TOTAL DISINFECTANT

## TOTALLY ACTIVE

* VERY BROAD SPECTRUM OF ACTIVITY:
  - Hydro/lipophilic viruses
  - G+ve, G-ve, fungi, moulds, yeasts
  - Mycoplasma
  - Spores

* RAPID ACTION TIME.

* ACTIVE IN DIRTYCONDITIONS :
  - All tests conducted in presence of organic matter.

* ACTIVE IN HARD WATER
  - Up to 1500 ppm of CaCO3.

* STABLE IN DILUTION

* FULL APPROVALS

* EFFECTIVE AT ALL TEMPERATURES

* PATENTED

## TOTALLY SAFE

* SAFE FOR THE USER :
  - Non toxic, non irritating.

* SAFE FOR THE ANIMALS :
  - Non toxic, non irritating.

* SAFE FOR THE EQUIPMENT :
  - Non corrosive.

* SAFE FOR THE ENVIRONMENT :
  - Biodegradable, contains no phenol and no formaline.