

# Tristel for Laboratories

## 1. Introduction

Tristel has developed a range of products specifically devised for use in laboratories, particularly in Containment Level 3 rooms.

Historically, clear soluble phenolic disinfectants, of which the leading brand was Hycolin, have been used in diagnostic laboratories, reference and research laboratories handling mycobacteria. Phenolic disinfectants have been withdrawn as a result of the European Biocidal Products Directive.

A biocidal chemistry that is effective against TB and other pathogenic mycobacteria is required to replace phenolic disinfectants. The Tristel Products for Laboratories incorporate Tristel's patented chlorine dioxide chemistry that has been established in peer reviewed published data as being highly effective against mycobacteria<sup>1</sup>.

Chlorine dioxide is also environmentally and ecologically friendly, which is why its continued use is permitted by the European Biocidal Products Directive.

## 2. The Tristel Chemistry

All Tristel Product for Laboratories incorporate Tristel's patented chlorine dioxide chemistry. Chlorine-dioxide is a well-documented, highly effective and safe biocide. The chemical symbol for chlorine dioxide is ClO<sub>2</sub>.

The Tristel for Labs products each have two components – a Base solution and an Activator solution, which instantaneously generate chlorine dioxide when mixed.

The Base solution is an organic acid blend, principally citric acid, combined with a buffering system that stabilises the pH at close to neutral and an inhibitor system that protects sensitive materials. The Tristel products are suitable for use on stainless steel surfaces.

The Activator is a sodium chlorite solution.

Incorporated in some of the Tristel for Labs products is an ultra low surfactant system, which combines high-level disinfection with effective cleaning. The ultra-low surface tension created promotes rapid cleaning and enhances the interface contact with the bacterial cell wall, thereby speeding biocidal activity of Tristel's chlorine dioxide.

Chlorine dioxide is a powerful oxidising agent that is non-selective and is rapidly effective against all micro-organisms, including spores. It also is effective against mycobacteria, viruses (enveloped and non-enveloped), bacteria, yeasts and fungi.

Tristel's chlorine dioxide is completely and rapidly bio-degradable.

## 3. Applications and uses

Tristel for Labs is a range of sporicidal disinfectants that can be used in laboratories for decontamination of all surfaces, including those of medical devices.

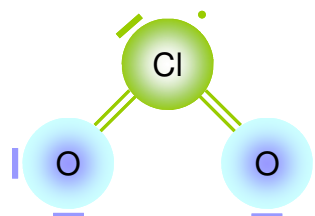
Examples of such surfaces are:-

- In-vitro diagnostic medical devices
- Isolators
- Ventilator hoods and cabinets
- Centrifuges
- Work surfaces
- Benches
- Floors and walls

The Tristel Products for Labs are suitable for use in pathology, research, university, pharmaceutical, food and veterinary laboratories.

The Tristel Products for Labs are a Class IIa Medical Device carrying the CE mark in accordance with the European Medical Device Directive 93/42.

<sup>1</sup> Griffiths, P.A., Babb, J.R. and Fraise A.P. (1999) "Mycobactericidal activity of selected disinfectants using a quantitative suspension test", Hospital Infection Research Laboratory, Journal of Hospital Infection. Vol. 41: 111-121. The study demonstrated Tristel to be the most rapidly acting disinfectant against *Mycobacteria*.



#### 4. The Tristel products for Laboratories

The Tristel range for Labs provides the complete infection control response to the risks encountered within the laboratory environment, e.g. decontamination requirements of the Containment Level 3 rooms and Isolation rooms.

The Tristel range for Labs comprises the following products:

##### Tristel Duo for Labs

A sporicidal disinfectant dispensed as a foam for easy application within Class 1 Microbiological Safety Cabinets. Duo for Labs can kill organisms, including bacterial spores, on a surface with a contact time of only 30 seconds.

The Duo foam can be dispersed by any kind of wipe available on location, including a paper towel. Alternatively, the Duo foam can be dispersed using Tristel's own Duo Wipe which incorporates a special formulation that has a highly-effective cleaning action and is synergistic with the Duo foam. The Duo Wipe alone is effective against *MRSA*, *E. coli*, *Salmonella*, *Norovirus* and *SARS*.



##### Tristel Fuse for Labs

A liquid solution prepared in Tristel's unique "burstable" sachet for quick generation of two litres of chlorine dioxide solution for decontamination of In vitro diagnostic test equipment, centrifuges, discard pots, and work surfaces.

When prepared according to Tristel dilution guide, Fuse for Labs achieves sporicidal efficacy with a contact time of 5 minutes.



##### Tristel 1 Day Concentrate for Labs (T1DC)

A liquid solution prepared from Tristel Base and Activator concentrates that are dispensed from Bittex bottles (metered dosage) and diluted with water by the user. Using the dilution chart provided on the bottle label any required volume of Tristel sporicidal disinfectant solution can be prepared, avoiding wastage. Small volumes of chlorine dioxide solution can be prepared for decontaminating the interior of centrifuges and the disinfection of liquid waste.



## 5- How to Use Tristel Duo for Labs

For all applications and uses:

- **Do not use the Duo Foamer if it has been damaged or tampered with.**

### Step 1

Put on gloves.



### Step 2

Remove the transport locks on the Duo Foamer that stop the pump being depressed in transit. It is recommended that these are retained and replaced after using the Duo Foamer.



### Step 3

If the Duo Foamer is being used for the first time, depress the pump two to four times to prime the Foamer. When primed, depress the pump to dispense one 0.8 ml aliquot of chlorine dioxide foam onto the surface.

**Note:** Two aliquots are sufficient to kill spores inoculated onto a 60 cm square surface when the Duo Foam is dispersed by the Tristel Duo Wipe.



### Step 4

Use a paper towel or a wipe (Tristel Duo Wipe is recommended) to disperse the Duo Foam over a surface.

### Step 5

Discard the paper towel/wipe to clinical waste. Do not re-use.



### Step 6

Leave the surface to dry to ensure a 30 second contact time.

## 6. How to Use Tristel Fuse for Labs

For all applications and uses:

- Do not use Fuse for Labs sachet if it has been damaged or tampered with.

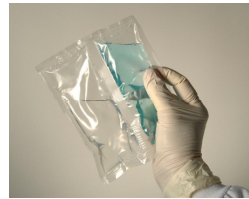


### Step 1

Take one Fuse for Labs sachet to produce two litres of working ClO<sub>2</sub> solution.

### Step 2

Squeeze one side of the sachet to burst contents through centre seal. Contents will start to turn yellow, which confirms that solution is being activated.



**Note:** Two hands can be used to assist bursting

### Step 3

Move contents of the sachet from side to side for 30 seconds.



### Step 4

Prepare a container/bucket with 2 litres of water. Cut a corner of the sachet.



### Step 5

Pour the contents of the sachet into two litres of water.



**Note:** Fuse for Labs achieves sporicidal efficacy with a contact time of five minutes. .

## 7. How to Use Tristel One-Day Concentrate for Labs

For all applications and uses:

- **Do not use Fuse for Labs sachet if it has been damaged or tampered with.**

With Tristel One-Day Concentrate the user mixes Activator with Base and then adds potable (tap) water in the following sequence:-

### Step 1

Use the dilution guide below to determine the required volumes of Activator, Base and water.

### Step 2

Using either the measuring cylinders at the top of the Activator and Base bottles, or a syringe, measure and pour/draw the required volumes of Activator and Base into a mixing vessel.

### Step 3

Wait thirty seconds or until the mixture assumes a yellow/green colour.

### Step 4

Add the required volume of water.



### T1DC for Labs Dilution Guide

Base (mls)	Activator (mls)	Water (mls)	Volume of working solution
100	100	4800	5 litres
40	40	1920	2 litres
20	20	960	1 litre
10	10	480	500 mls

### Useful Tips

- If you use syringes to draw up the activator and base, use the syringe once only to avoid contamination between Activator and Base solutions. If, however, you want to re-use syringes dedicate one syringe to the Activator bottle and another to the Base bottle. Colour coding the syringes with tape – white for Activator and blue for Base will help to keep them separated.
- Bottled sterile water can be used instead of potable water.
- Use cold or room temperature water.

## 8. Biocidal performance

	Bactericidal	Virucidal	Fungicidal	Mycobactericidal	Sporicidal
Duo for Labs	30 sec	30 sec	30 sec	30 sec	30 sec
Fuse for Labs	5 min	5 min	5 min	5 min	5 min
T1DC for Labs	5 min	5 min	5 min	5 min	5 min

The Tristel products for Laboratories utilise the patented chlorine dioxide chemistry used in the wide range of Tristel products including instrument sterilants which have become the most widely used replacements for the 2% glutaraldehyde disinfectant in the United Kingdom.

### Chlorine dioxide

Chlorine dioxide is a well-documented, highly effective and safe biocide. The chemical symbol for chlorine dioxide is ClO<sub>2</sub>. Chlorine dioxide is a powerful oxidising agent and is rapidly effective against all micro-organisms, including spores. It has been extensively tested to validate its biocidal performance. Many organisms, including *Bacillus subtilis* spores and *Mycobacterium terrae*, have been tested, both to the European Norms and with a standardised methodology that involves the inoculation of surfaces with the test organism.

### Efficacy of chlorine dioxide

#### Spores:

*Bacillus cereus*  
*Bacillus subtilis*  
*Bacillus subtilis* var *niger*  
*Clostridium difficile*

#### Mycobacteria:

*Mycobacterium avium-intracellulare*  
*Mycobacterium chelonae*  
*Mycobacterium fortuitum*  
*Mycobacterium terrae*  
*Mycobacterium tuberculosis*  
*Mycobacterium tuberculosis* Poli-R

#### Viruses:

*Canine Parvovirus*  
*Coxsackivirus B3*  
*Hepatitis A*  
*Hepatitis B*  
*Hepatitis C*  
*Herpes simplex virus Type 1*  
*HIV Type 1*

#### Viruses:

*Human Norovirus*  
*Influenza virus Type A2*  
*Poliovirus Type 1*  
*Poliovirus Type 2*  
*SARS*

#### Fungi:

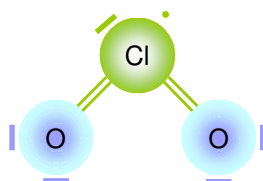
*Aspergillus niger*  
*Candida albicans*

#### Bacteria:

*Acetobacter baumannii*  
*Clostridium difficile*  
*Enterococcus faecium* (vancomycin resistant)  
*Enterococcus hirae*  
*Escherichia coli*  
*Pseudomonas aeruginosa*  
*Pseudomonas aeruginosa* (gentamicin resistant)  
*Staphylococcus aureus*  
*Staphylococcus aureus* (methicillin resistant)

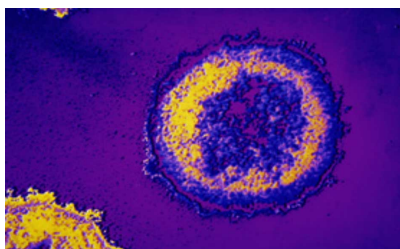
Selected key tests demonstrating **Tristel's micro biological efficacy** include:

Test authority	Standard	Organisms
Hospital Infection Research Laboratory, UK	As published in JoHI (1998, 38)	<i>Bacillus subtilis</i> spores
Conclusion	<p><i>'A &gt;6 log<sub>10</sub> reduction is used as an indication of acceptable sporicidal activity. Tristel Single Shot when tested for use in the Labcaire Endoscope Washer Disinfector gave a &gt;6 log<sub>10</sub> reduction in 10mins under clean and dirty conditions when tested at 10°C and 5mins at 20°C. The formulation for use in the Wassenburg Washer Disinfector gave a 6 log<sub>10</sub> reduction in 5 mins under clean and dirty conditions.'</i></p>	
Institute de Recherche Microbiologique, France	AFNOR T72-300	<i>Bacillus subtilis</i> spores, <i>Bacillus cereus</i> spores
Conclusion	<p><i>'Le dioxyde de chlore fabriqué par l'appareil Tristel Generator à partir des produits Tristel One Shot Base et Tristel One Shot Activator est efficace sur les spores des souches bactériennes testées en 5 minutes de contact à 20°C, selon la norme AFNOR T72-300, à la concentration de 15 ppm pour Bacillus subtilis et à 45 ppm pour Bacillus cereus en présence d'eau dure à 30°C.'</i></p>	
Institute de Recherche Microbiologique, France	EN 13704	<i>Bacillus subtilis</i> spores
Conclusion	<p><i>'Le dioxyde de chlore présente une activité sporicide dès 48 ppm (dioxyde de chlore à 60 ppm dilué à 80% (v/v)) en 1 minute à 20°C, en présence d'albumine bovine selon à 0,3 g/l.'</i></p>	
Hospital Infection Research Laboratory, UK	As published in JoHI (1998, 38)	<i>Mycobacterium terrae</i>
Conclusion	<p><i>'A &gt;5 log<sub>10</sub> reduction in Mycobacterium terrae is used as an indication of high/intermediate level disinfection and tuberculocidal activity. Tristel Single Shot when tested for use in the Labcaire Endoscope Washer Disinfector gave a &gt;5 log<sub>10</sub> reduction in 5mins under clean and dirty conditions when tested at 10°C and 20°C. The formulation for use in the Wassenburg Washer Disinfector gave a &gt;5 log<sub>10</sub> reduction in 1 min under clean and dirty conditions at 40°C.'</i></p>	





Test authority	Standard	Organisms
Institute de Recherche Microbiologique, France	AFNOR T 72-301 & T 72-171	<i>Mycobacterium tuberculosis</i> , <i>Mycobacterium avium</i> , <i>Mycobacterium terrae</i>
Conclusion	<p><i>“Le produit dioxyde de chlore est efficace à 20°C, selon la norme AFNOR T72-301 en eau dure à 30°C, sur les souches Mycobacterium tuberculosis, Mycobacterium avium, et Mycobacterium terrae:</i></p> <ul style="list-style-type: none"> <li><i>- à la concentration de 100 ppm en 5 minutes de contact</i></li> <li><i>- à la concentration de 50 ppm en 15 et 30 minutes de contact.’</i></li> </ul>	
Biotech-Germande, France	prEN 14348	<i>Mycobacterium avium</i> , <i>Mycobacterium terrae</i>
Conclusion	<p><i>‘According to EN 14348, the disinfectant solution “One Shot” (Tristel) when diluted in hard water at 0.66% (v/v) presents a mycobactericidal activity under clean conditions (0.3 g/l bovine albumin) against the reference strains of Mycobacterium avium and Mycobacterium terrae within:</i></p> <ul style="list-style-type: none"> <li><i>- 60 minutes at 20°C (obligatory test conditions)</i></li> <li><i>- 5 minutes at 20°C (use conditions).</i></li> </ul> <p><i>In those test conditions, the mean reduction of the two assays performed with each of the two test strains is above 10<sup>6</sup>’</i></p>	
Institute de Recherche Microbiologique, France	AFNOR T 72-180	<i>Picornaviridae</i> (Poliovirus type 1), <i>Adenovirus</i> , <i>Poxviridae</i> (Orthopoxvirus)
Conclusion	<p><i>‘Le produit dioxyde de chlore à 120 ppm est virucide selon la norme AFNOR NF T72-180 en 5 minutes de contact à 20°C à la concentration de 90% (v/v).’</i></p>	
PHLS, UK		<i>Poliovirus type 2</i> , <i>Herpes simplex virus type 1</i>
Conclusion	<p><i>‘Virus infectivity as measured by the TCID<sub>50</sub> of the virus controls was 10<sup>7</sup> for poliovirus type 2 and 10<sup>3</sup> for herpes simplex virus type 1. No infectious virus was detected after treatment with Tristel 100 solution for 5, 15 or 30 minutes.’</i></p>	





Test authority	Standard	Organisms
Micropathology, UK		<i>Hepatitis C virus</i>
Conclusion	<p><i>'To be considered successful in this protocol a biocide must be able to reduce the amount of virus molecules to an undetectable level.</i></p> <p><i>Tristel One-Shot, with a 5 minute contact time, reduced the detectable virus specific molecule in the blood sample to below the limit of detection of the assay and it was therefore successful in this indirect estimation of its activity against HCV.'</i></p>	
Micropathology, UK		<i>HIV</i>
Conclusion	<p><i>'To be considered successful in this protocol a biocide must be able to reduce the amount of virus molecules to an undetectable level.</i></p> <p><i>Tristel One-Shot, with a 5 minute contact time, reduced the detectable virus specific molecule in the blood sample to below the limit of detection of the assay and it was therefore successful in this indirect estimation of its activity against HIV.'</i></p>	
Biotech-Germande, France	EN 13624	<i>Candida albicans</i>
Conclusion	<p><i>'According to EN 13624, the disinfectant solution "One Shot" (Tristel) when diluted in hard water at 0.66% (v/v) presents under clean conditions (0.3 g/l bovine albumin) a yeasticidal activity against the reference strain of Candida albicans within:</i></p> <ul style="list-style-type: none"> <li><i>- 60 minutes at 20°C (obligatory test conditions)</i></li> <li><i>- 5 minutes at 20°C (use conditions).'</i></li> </ul>	
Institute de Recherche Microbiologique, France	EN 13727	<i>Pseudomonas aeruginosa,</i> <i>Staphylococcus aureus,</i> <i>Enterococcus hirae</i>
Conclusion	<p><i>'Le produit dioxyde de chlore préparé avec l'appareil Tristel Generator à partir des produits Tristel One Shot Base et Tristel One Shot Activator est bactéricide selon la norme NF EN 13727, en 5 minutes de contact à 20°C en présence d'albumine bovine à 0,3 g/l en final lors de l'essai sur les souches de référence Pseudomonas aeruginosa, Staphylococcus aureus et Enterococcus hirae à la concentration de 60 ppm.'</i></p>	



Test authority	Standard	Organisms
Hospital Infection Research Laboratory, UK	EN 13727	<i>Pseudomonas aeruginosa</i> <i>Staphylococcus aureus</i> Problematic clinical isolates of <i>Candida albicans</i> Methicillin resistant <i>Staphylococcus aureus</i> Gentamicin resistant <i>Pseudomonas aeruginosa</i> , Vancomycin resistant <i>Enterococcus faecium</i>

**Conclusion**

*'Tristel 100, when prepared in accordance with the manufacturers instructions, was found to be effective in destroying type strain cultures of Ps. Aeruginosa, Staph. Aureus and problematic clinical isolates of Candida albicans, Staph. Aureus (MRSA type 15), Ps. Aeruginosa (gentamicin resistant) and Enterococcus faecium (vancomycin resistant) under conditions of minimal or low soiling i.e. 0.03% albumin. Tristel 100, therefore, meets the requirements of [nowadays EN13727] i.e. at least a 5 log<sub>10</sub> reduction within the shorter time interval of 1 min. However, when the disinfectant was tested under dirty conditions, Tristel 100 just failed to achieve a >5 log<sub>10</sub> reduction with one of the test organisms i.e. Staph.aureus (MRSA) and Candida albicans was greatly reduced, although a >5 log<sub>10</sub> reduction was achieved. Tristel 100 is not recommended for instruments and surfaces that have not been pre-cleaned.'*

Biotech-Germande, France	EN 14561	<i>Pseudomonas aeruginosa</i> , <i>Staphylococcus aureus</i> , <i>Enterococcus hirae</i>
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**Conclusion**

*'According to EN 14561, the disinfectant solution "One Shot" (Tristel) when diluted in hard water at 0.66% (v/v) presents under clean conditions (0.3 g/l bovine albumin) a bactericidal activity against the referenced strains of Pseudomonas aeruginosa, Staphylococcus aureus, and Enterococcus hirae within:*

- 60 minutes at 20°C (obligatory test conditions)*
- 5 minutes at 20°C (use conditions).*

*In those test conditions, the mean reduction of the two assays performed with each of the three tested strains is above 10<sup>5</sup>.'*

The Tristel chemistry's efficacy is tested using off-the-shelf products that are offered in **liquid formats**, for instance Tristel One Shot products, Tristel Generator solutions and Tristel Fuse/Fusion formats. Not only do we test the Tristel's liquid chemistry, we also conduct addition tests on our specific product formats to confirm the validity of the data.

Supplementary tests confirming the validity of data for the **Tristel Duo Foam** format include:

Test authority	Standard	Organisms
Hospital Infection Research Laboratory, UK	As published in JoHI (1998, 38)	<i>Bacillus subtilis</i> spores
Conclusion	<i>'A <math>\times 6 \log_{10}</math> reduction is used as an indication of acceptable sporicidal activity. Tristel foam solution tested freshly prepared at a 1 in 10 dilution of the in-use concentration gave <math>\times 6 \log_{10}</math> reduction in 30 secs under clean and dirty conditions.'</i>	
Hospital Infection Research Laboratory, UK	As published in JoHI (1998, 38)	<i>Mycobacterium terrae</i>
Conclusion	<i>'A <math>\times 5 \log_{10}</math> reduction in Mycobacterium terrae is used as an indication of high/intermediate level disinfection and tuberculocidal activity. Tristel foam solution tested freshly prepared at a 1 in 10 dilution of the use concentration gave a <math>\times 5 \log_{10}</math> reduction in 30 seconds under clean and dirty conditions.'</i>	
Bluscientific, UK		Five representative epidemic strains of <i>Methicillin resistant staphylococcus aureus</i>
Conclusion	<i>'These data indicate that with the exception of EMRSA 15 and EMRSA Iberian at a high soil load of 3.0 g/l BSA with a contact time of 30 seconds, Tristel DUO wipes effectively reduce the infectivity of a desiccated film of each of the five global EMRSA strains from a stainless surface by at least 5 <math>\log_{10}</math>. Desiccation itself has lead up to approximately a 200-fold reduction in viability, as illustrated by the experimental conditions control. A comparison of the Filtration Test Control (mock disinfectant neutralisation) and the Filtration Control indicates that residual disinfectant does not have a biostatic effect on bacterial growth, thus the neutralisation protocol employed has been effective.'</i>	
Bluscientific, UK		<i>Human Norovirus (Feline calicivirus)</i>
Conclusion	<i>'These data indicate that feline calicivirus levels are reduced by a least 2.23 <math>\log_{10}</math> at 30 seconds and 60 seconds contact in low soil and by 1.69 <math>\log_{10}</math> at 30 seconds and 60 seconds at high soil. The limit to this reduction is probably due to loss of infectivity of the virus due to desiccation, approximately by <math>5.0 \times 10^6</math> TCID<sub>50</sub> units. However, in all cases virus infectivity is completely removed to the level of sensitivity of the assay (<math>3.2 \times 10^2</math>) by application of Tristel DUO wipes.'</i>	

## 9. Health & Safety

The chlorine dioxide concentration employed in the Tristel products for Laboratories is carefully controlled and is safe to handle and use. It is recommended that gloves (of any type) are used as part of General Laboratory Practice.

Toxicology studies have been conducted in the United Kingdom and the United States and have shown that there are no reactions or contraindications when Tristel's chlorine dioxide has been tested for eye irritation, skin irritation, skin sensitisation and acute oral toxicity.

### Product Data

For comprehensive Product Safety Data Sheets contact Tristel Solutions Limited or your local Tristel representative.

### Activated Duo Foam

#### Composition:

Chlorine dioxide in aqueous solution

**CAS No:** 10049-04-4  
**EINECS No:** 233-162-8  
**Wt/Vol%** 0.015% (150ppm)  
**Symbol** ClO<sub>2</sub>

#### Hazards Identification:

Chlorine dioxide generator (OES 0.3ppm short term, 0.01ppm long term)

### Tristel Duo Foam – Base Solution

#### Composition:

Blend of organic acids (principal ingredient citric acid 5%), preservatives, buffers and corrosion inhibitors.

#### Hazards Identification:

No Specific hazards

### Tristel Duo Foam – Activator Solution

#### Composition:

Sodium chlorite (0.5%), foamers and humectants

#### Hazards Identification:

No Specific hazards

### Fuse for Labs – Activated Solution

#### Composition:

Chlorine dioxide in aqueous solution

**EC registration No:** 233-162-8  
**CAS No:** 10049-04-4  
**Wt/Vol%** 0.025-0.03%  
**Symbol** ClO<sub>2</sub>

**Hazards Identification:**

Chlorine dioxide generator (OES 0.3ppm short term, 0.01ppm long term).

**Fuse for Labs sachet – Base Solution****Composition:**

Blend of organic acids (principal ingredient citric acid 5.0%), preservatives, buffers, surfactant and corrosion inhibitors.

**Hazards Identification:**

No Specific hazards

**Fuse for Labs sachet – Activator Solution****Composition:**

Sodium chlorite (2.1%)

**EC registration No:** 231-836-6

**Hazards Identification:**

No Specific hazards