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| **Procedure for Disinfection** | |
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# Abbreviations

|  |  |
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| COSHH | Control of substances Hazardous to Health |
| BSL3 | Biosafety level 3 |

# Introduction

## PURPOSE AND SCOPE

The purpose of this document is to ensure that your institute and department staff are aware of their responsibilities with regard to laboratory disinfection and to comply with the health and safety policy (insert document name here) to prevent cross-contamination or occupational exposure to themselves and fellow workers throughout the department.

This policy is to inform and instruct your institute and department staff of what disinfectants are available for use and how and when they should be used.

**Disinfection** is used to reduce the number of micro-organisms present to an acceptable level such that the item being disinfected is safe to handle. Disinfection should not be confused with **sterilisation**, a process that renders an object free from all viable organisms. Both disinfection and sterilisation are methods of **decontamination** as this is the general term used to reduce microbial contamination to render an item ‘safe’. Cleaning may also be regarded as a decontamination method as it too can remove micro-organisms from a soiled surface.

R**esponsibility**

The (person who is responsible, e.g. Centre Director) is responsible for ensuring the implementation and maintenance of this procedure.

Under the Health and Safety at Work act (1974), and the HSE/EEC regulations, all employees are required to take reasonable care for the health and safety of themselves and of others, who may be affected by their acts or by their omissions. They are also required to co-operate with the employing authority, so far, as is necessary to fulfil the obligations of the act.

**This procedure must be read and understood by all laboratory staff in the** your institute and department **and should be read in conjunction with the Health and Safety Policy** insert document name here**.**

It is the individual’s responsibility to raise day-to-day issues with the Laboratory Manager, Health & Safety Officer and Centre Director where appropriate.

Each member of staff undertaking this procedure is responsible under Clinical Governance & Health and Safety at Work Act for the Quality of work performed and the safety of themselves and others.

**References**

* Working with substances hazardous to health – a brief guide to COSHH (leaflet INDG136 (rev5) revised 10/12
* Control of substances hazardous to health L5 (sixth edition) published 2013 ISBN 978 0 7176 6582 2
* Safe working and the prevention of infection in clinical laboratories and similar facilities (HSE ISBM 978 0 7176 2513 0).
* The management, design and operation of microbiological containment laboratories. ACDP publication (ISBM 978 7176 2034 0)

**Definitions**

**Risk assessment** – a method of evaluating the risk in a process/system

**Occupational exposure** – reasonably anticipated skin, eyes, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee’s duties

**COSHH** – control of substances Hazardous to Health

**Near miss** – an event that did not lead to an accident but does pose a risk

**Related documents**

* Health and Safety Policy (insert document name here)
* Storage and removal of waste (insert document name here)
* Preparation and use of your validated disinfectant e.g. Tristel (Chlorine dioxide) disinfectant (insert document name here)
* Daily preparation of your validated disinfectant e.g. Tristel (insert document name here)
* Decontamination of an individual from BSL3 (insert document name here)
* Fumigation of class I and class II microbiological safety cabinets (insert document name here)
* Overview of biosafety level 3 laboratories (insert document name here)
* Procedure in the event of a biological spillage or chemical event (insert document name here)

**OVERVIEW TABLE**

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| --- | --- | --- | --- | --- | --- |
| **Disinfectant name** | **Active chemical** | **Stability** | **Activity** | **Contact time for effectiveness** | **Usage** |
| **Tristel** | **Chlorine dioxide** | **24 hours** | **Sporicidal**  **Mycobactericidal**  **Virucidal**  **Fungicidal**  **Bactericidal** | **5 minutes** | **Surfaces**  **Small spills** |
| **Haz-tabs disinfectant tablets** | **Hypochlorite**  **(NaDCC)** | **24 hours** | **Bactericidal**  **Mycobactericidal**  **Poorly sporicidal** | **1,000 ppm virucidal in 5 minutes**  **5,000 ppm ppm tuberculocidal in 5 minutes** | **Large biological spills**  **Cleaning molecular areas/racks** |
| **Haz-tabs disinfectant granules** | **Hypochlorite**  **(NaDCC)** | **24 hours** | **Bactericidal**  **Mycobactericidal**  **Poorly sporicidal** | **2 minutes** | **Spinkled on a biological spill for 2 minutes prior to collection** |
| **70% ethanol** | **70% ethanol** | **Long term** | **Bactericidal**  **Not sporicidal**  **Action on non-lipid viruses variable** | **10-30 minutes** | **Surfaces** |
| **Formaldehyde** | **Formaldehyde vapour** | **Unstable** | **All microorganisms** | **Poorly penetrating**  **overnight** | **Cabinets**  **Sealed rooms (only in the event of a spill)** |
| **Virusolve** | **Dodecylamine based structures** | **Stable until use by date** | **Sporicidal**  **Mycobactericidal**  **Virucidal**  **Fungicidal**  **Bactericidal** | **5 minutes** | **Used for decontamination of an individual in an emergency CL3 response** |
| **Distel (formerly Trigene)** | **Halogenated tertiary amine compound** | **Stable until use by date** | **Nucleic acids** | **At least 5 minutes** | **Surfaces where nucleic acid removal is required** |

**DISINFECTION POLICY**

It is important to distinguish between disinfection, sterilisation and the role of cleaning. Cleaning is an essential prerequisite to disinfection, therefore deposits of organic matter should always be removed prior to disinfection. It is also important to realise that disinfectants (apart from not generally killing all the organisms), do not disinfect all organisms equally well.

To ensure the efficacy of the disinfectant, consider the type of micro-organism/s to be destroyed. Disinfectant activity will vary depending on the following factors:

* Sensitivity of the micro-organism
* Type of disinfectant
* Microbial load

Allow adequate exposure/contact time for the disinfectant to be effective, this should be as long as is reasonably practical (objects should be fully immersed without air pockets). Consider the presence of inactivating factors; such as excessive organic material (e.g. blood or serum), chemical agents (e.g. detergents) or change in pH.

**Use freshly prepared disinfectants – stored diluted solutions may lose their activity**

Ensure the working dilution of the disinfectant is suitable for the task. Avoid excessive dilution of the disinfectant by waste fluids, unless the initial concentration of the disinfectant has been increased to allow for subsequent dilution.

The HSE have recommended that the autoclave of dry discard should replace discard pots with disinfectant wherever possible. This recommendation is followed by the your institute and department.

Where possible (your disposal route e.g. Dispo-Safe jars) are used for the dry disposal of contaminated items and these are then autoclaved directly.

**Recommended disinfectants**

Only a limited number of products are used within the your institute and department as detailed below.

The following disinfectants and concentrations are recommended for use in laboratories within the your institute and department: FOR EXAMPLE:

* Chlorine dioxide (Tristel Fuse)
* Sodium Dichloroisocyanurate (NaDCC), 10,000 ppm (1%) – Haz-Tab tablets
* Alcohol (ethanol) or IMS (industrial methylated spirits) 70%
* Didecyldimethylammonium chloride & Bis (3-aminopropyl) dodecylamine –Virusolve
* Formaldehyde Halogenated tertiary amine compound -Distel (formerly Trigene)

**Tristel (Chlorine dioxide)**

Tristel (an aqueous solution of chlorine dioxide) has an activity that differs from hypochlorite as it does not produce free chlorine. It is active against bacteria, including *Mycobacterium spp*., viruses, fungi and spores. Activation of the disinfectant is required before use. Chlorine dioxide is not a skin or respiratory sensitizer or irritant. At low concentrations it has a history of safe use and has been used to sanitise drinking water and swimming pools since the 1950s. At higher concentrations (210-260ppm) it has rapid bactericidal activity against *Mycobacterium spp*. and is a more effective sporocide than hypochlorite. Chlorine dioxide may affect certain metals, but (unlike hypochlorite) is not corrosive to high grade steel.

Tristel’s biocidal action is based on the creation of metastable chlorous acid in solution with the subsequent release of chlorine dioxide upon contact with the micro-organism cell surface. Chlorine dioxide is a highly effective biocide, but because the chemical structure at the surface of mammalian cells differs from that of micro-organisms it is non-toxic to human cells.

Tristel achieves the 3 basic criteria for chemical sterilisation:

* Absorption of the compound by the cell wall
* Penetration of the compound into the cell protoplasm
* Reaction with one or more of the cell’s constituents

Tristel inhibits the metabolic enzymes and obstructs the metabolism of glutamic acid within the cell. Tristel acts as an oxidising agent upon the metabolism, speeding it up to the detriment of the cell. Tristel reacts directly with the basic molecular structure of the cell’s proteins, thus killing the cell.

For these reasons, Tristel has been selected as the your institute and department laboratory disinfectant of choice.

This product is used for

* Daily disinfection of bench surfaces
* Decontaminating centrifuges and other laboratory equipment
* Decontamination of surfaces in the CL3 laboratories

**Contact time required for tristel activity is 5 minutes**

P**rocedure for daily preparation of Tristel**

Tristel **must** be prepared daily. Fill out the Daily preparation of Tristel log (insert document name here).

The preparation is as per the manufacturer’s instructions. The base (citric acid) and activator (sodium chlorite) are supplied in sachets (manufacturer number TSL010501). These are mixed for **at least 30 seconds. This must be timed and recorded on** insert document name here**.** This is then added to 5L final volume of water to produce active disinfectant. Make a label with the date for the stock container and all other containers that it is subsequently decanted into.

**Hypochlorites**

Hypochlorites have a wide spectrum of antimicrobial activity, are rapid in action and are recommended for general infectious spillages. They are highly effective against vegetative bacteria, viruses and fungi and are disinfectants of choice for blood borne viruses such as HIV and hepatitis viruses. However, they are slowly active against bacterial spores. Furthermore they can be inactivated at low concentrations by organic matter. Sodium hypochlorite is active against *Mycobacterium spp.* With activity increasing with higher concentrations of hypochlorite.

Hypochlorites are corrosive and may damage equipment and stainless steel surfaces, therefore caution needs to be observed when contact with metals is involved.

**NOTE: Hypochlorites (chlorine releasing chemicals) should not be mixed with the following:**

**Strong acids – chlorine gas is released at low pH**

**Formaldehyde or formalin – bis chloromethyl ether (a lung carcinogen) is released**

**Ammonia cleaning solutions – chloramine gas (which can cause lung injury) is released.**

Hypochlorite solution should therefore be removed from any MSC or room to be fumigated with formaldehyde.

**Haz-Tab disinfectant Granules (for large and floor spillages)**

Haz-Tab granules are used for containment and disinfection of bio-hazardous spills. They are located in the yellow spill kits in each laboratory in your institute and department. The granules contain Sodium dichloroisocyanurate (NaDCC) – a chlorine releasing agent and an inert absorbent material. These granules should be used as per the instructions located in the kit and with reference to Procedure in the event of a biological spill or chemical event (insert document name here). Granules are added to the spill for at least a **2 minute contact time**.

**Haz-tab disinfectant tablets**

* Used for disinfection of areas that have had a biohazardous spill, and are part of the biohazard spill kit. Refer also to: Procedure in the event of a biological spill or chemical event (insert document name here). The tablets contain Sodium dichloroisocyanurate (NaDCC) – (chlorine releasing agent) – giving 2.5g of free chlorine per tablet.

**1 tablet + 250mL water yields 10,000ppm available chlorine**

**Allow a 5 minute contact time for Haz-tabs**

* NaDCC is used at 10,000ppm to destroy nucleic acids.

Sodium hypochlorite stock solutions will decay with time, light and increased temperature and should be stored in cool and dark conditions. Working solutions of hypochlorite need to be changed frequently (at least daily), because of decomposition in solution and deterioration caused by the addition of organic matter.

**Alcohols**

Alcohols (e.g. 70% ethanol or industrial methylated spirits – IMS) are effective against many bacteria including *Mycobacterium spp*. and fungi. They have variable activity against viruses, being less effective against non-envelope viruses. Alcohols have no activity against spores.

Alcohols are particularly useful for low level contamination and surface decontamination, but penetrate organic matter poorly, particularly proteinaceous material, therefore cleaning beforehand is essential. As alcohols are relatively volatile they do not provide sustained antimicrobial action and therefore should be confined to surfaces that are visibly clean.

Due to their flammability they should not be used near flames or equipment likely to generate sparks. Alcohol sprays must not be used on electrical equipment whilst connected to the mains. When used to decontaminate centrifuges, allow time for the alcohol to safely evaporate before turning the equipment on.

Alcohols should not be used undiluted (100% alcohol is not an effective disinfectant). The most effective strength for alcohol disinfection is a 70% (v/v) solution of ethanol in water. IMS, which comprises 95% ethanol and 5% methanol is also suitable when diluted.

In the your institute and department, 70% alcohol can be used for surface disinfection where no spills have occurred.

**Virusolve**

Virusolve is used only in the event of a biological spill in the CL3, which has resulted in contamination on an individual. The details for decontaminating an individual from CL3 are given in insert document name here. Virusolve was chosen for this since it has a good safety profile for skin, not containing any hazardous aldehydes or chorine generating compounds.

**The contact time required is 5 minutes.**

**Distel (formerly Trigene)**

N.B. this is not Tristel, despite the similarity of the names.

**Aldehydes**

**Formaldehyde**

The use of formaldehyde is limited to gaseous fumigation of MSCs and containment level 3 laboratories. The gas is very toxic with a WEL (workplace exposure limit) of 2 ppm. Extreme caution is required for the fumigation procedure (see insert document name here) and instructions followed according to insert document name here. Safety cabinets should be fumigated when the HEPA filter needs to be replaced, when access to internal ducting or fittings is necessary or the nature of the work or a spillage demands it. Also see Overview of containment level 3 laboratories (insert document name here). Fumigation is performed overnight to ensure efficacy. Fumigation of rooms is performed by an external contractor. your institute and department only fumigates cabinets.