Information Sheet

Biological Safety – Disinfection and Sterilisation

1.0 Introduction

In order to protect human health and the environment, it is important that any research areas, equipment, and biological waste is decontaminated as appropriate.

Infectious and genetically modified waste needs to be deactivated prior to disposal from the University. There are waste management guidance notes available to help with the disposal routes for the waste types following inactivation: Sustainability - Waste guidance notes.

2.0 Disinfection

Disinfection is defined as the process of eliminating or reducing harmful microorganisms from inanimate objects and surfaces and aims to reduce the number of microorganisms by at least 5 log fold. Disinfectants have variable activity against different types of organisms and can be inactivated by organic material or other chemicals and need to be used at the correct dilution.

The choice and effectiveness of appropriate disinfectant for inactivation depends on several factors, including:

- Nature and number of the micro-organism(s)
- Nature of the material being disinfected e.g. surfaces, instruments etc.
- The presence/ quantity of organic material e.g. soil, blood.
- Circumstances under which disinfection is required (e.g., cleaning, spillages, or waste inactivation).
- Health hazards presented by the disinfectant.
- Contact (exposure) time.

Selected disinfectants should be used at concentrations appropriate for the work, considering the manufacturers' recommendations. Caution is needed if mixing disinfectants with each other (or with detergents) as some mixtures are incompatible.

The effective life of diluted disinfectants varies but it is good practice to renew solutions regularly, often daily. Disinfectants in containers must be marked and dated. If immersing objects in disinfectant, always make sure they are completely immersed.

See Appendix A for disinfectant guidance sheet which provides a summary of the different disinfectants and their uses (note this is not an exhaustive list).

Regardless of disinfectant type and concentration, all laboratories should aim to reduce the volume of waste put to drain. Hazardous chemicals must not be put down drains but contained separately

and removed for disposal. If liquid, inactivated waste can be poured down the drain (this should be recorded on the discharge to drain log) once any solid material has been removed e.g. sieved. The solid material should be contained separately for removal as offensive waste.

Once waste has been chemically inactivated, it should be classed as 'offensive' waste provided it has no other hazardous properties and removed directly for disposal. This waste is identified by black and yellow striped bags (tiger stripe) and is disposed by incineration in a plant which also generates electricity from the heat generated.

3.0 Sterilisation

Sterilisation is defined as the process of making something free from bacteria or other living microorganisms and aims to kill all microorganisms present. The most common methods of sterilisation in use at the University involve autoclaving which is carried out on campus and incineration which is carried out campus.

Autoclaves are high temperature and high-pressure devices, which may involve use of a vacuum and steam to generate the atmosphere and pressure required to kill off microorganisms. The use of autoclaves is restricted to trained individuals who are trained and competent to use the autoclave and understand the hazards.

Commonly used waste programs must be validated annually by 12 pen validation methods to ensure that the temperature you are setting is distributed evenly throughout the load. All liquid and solid Cat 2 waste must be autoclaved prior to leaving the lab/building unless it is chemically disinfected first.

4.0 Appendix A

Disinfection Guidance Sheet

The manufacturer's information and Safety Data Sheet (SDS) should provide most of the relevant information needed to help choose the most suitable disinfectant and complete a risk assessment.

Disinfectant	Active against	Not recommended for	Inactivated by	Incompatible with	Autoclave	Other comments
Alcohol	Vegetative Bacteria, fungi, many viruses, protozoa, parasites	Spores	Does not readily penetrate organic matter		No	Optimal range 60% - 90%, Flammable should not be used near flames or electrical equipment likely to general sparks e.g. refrigerator. Can be used as a skin disinfectant must be diluted.
Aldehydes e.g. Glutaraldehyde	Bacteria, mycobacteria, fungi, viruses	Slow action on spores			No	More active in alkali than acidic pHs, can cause respiratory problems and significant dermatitis. Use should be avoided unless no suitable alternative and sufficient justification is made as part a suitable and sufficient risk assessment
Biguanides e.g. Chlorohexidine	Bacterial sporicidal, fungi	Not sporicidal but prevents spores, mycobacterium, viruses		Anionic, Soap	Yes if <1% solution	
Hexachlorophene	Gram positive bacteria	Other microorganisms		Anionic, soap	No	

Disinfectant	Active against	Not recommended for	Inactivated by	Incompatible with	Autoclave	Other comments
Hypochlorites	Vegetative bacteria, fungi, viruses	Mycobacteria, spores	Inactivated by organic material	Cationic detergents (if mixed with acids chlorine gas is released at low pH) DO NOT mix with formaldehyde – carcinogenic products produced	No	Bleaches fabric corrodes some metals, irritant and damages rubber.
Iodine and iodophores	Vegetative bacteria, fungi, viruses				No	May corrode metals, can stain.
Peroxygen e.g. Virkon	Bacteria, spores, fungi, viruses, and mycobacterium	Variable against spores, mycobacterium			Yes, if externally exhausted	Corrosivity varies with different products, not recommended for metal surface. If using virkon autoclaving should only be undertaken if it is connected to main water supply and externally exhausted due the generation of sulphur dioxide.
Phenols	Vegetative bacteria, mycobacterium, viruses	Spores, some viruses and limited on fungi	Inactivated by rubber and some plastics	Cationic	No	Irritant, Toxic and corrosive will attack surfaces as well as organisms, some may also have disposal restrictions on them

Disinfectant	Active against	Not recommended for	Inactivated by	Incompatible with	Autoclave	Other comments
Quaternary Ammonium and Ampholitic Compounds e.g. Distel, trigene	Gram positive bacteria, fungi, some viruses, denatures DNA / RNA			Anionic, soap	Yes	No hazardous properties