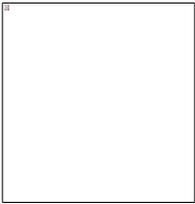






Decontamination and Waste Management



Surface Decontamination





Definitions

- **Germicide:** Any antimicrobial chemical agent used for disinfection, antisepsis or sterilization – regardless of whether its action is microbicidal or microbistatic; any microbicidal disinfectant, antiseptic or sterilant
- **Contamination:** Introduction of microorganisms into tissues or sterile materials
- **Decontamination:** Disinfection or sterilization of infected articles to make them suitable for use
- **Disinfection:** Selective elimination of certain undesirable microorganisms in order to prevent their transmission
- **Antisepsis:** Destruction of vegetative forms of microorganisms but not their permanent forms
- **Sterilization:** Complete killing of all microorganisms



Effectiveness of Germicides

- **Concentration of the Germicide**
- **Concentration of the Agent**
- **Type of Agent**
- **Time of Contact**
- **Environmental Conditions Present**

Surface Disinfectants

- Alcohols (Ethyl alcohol)
- Halogens (Sodium and Calcium hypochlorite)
- Quaternary Ammonium Compounds
- Phenolics (Lysol)
- Aldehydes (Formalin)
- Hydrogen peroxide
- Not all Lysol products are created equal



Autoclaves

Autoclaves





Principles of Autoclave Sterilization

- **Direct exposure of each item to steam at the required temperature and pressure for a specific time**
- **121o C - 123o C (250o F - 254o F)**
- **15 pounds per square inch (psi); 1.05 kg/cm²**
- **Time**
 - Minimal time required depends on the weight and specific nature of the objects to be sterilized
- **Steam must contact all areas of a load**
- **Loosely gathered biohazard bags**
- **Add 500 ml of water to bags prior to packaging and transport to allow for steam saturation**

Why Autoclave

- Properly used autoclaves may be used to sterilize instruments, other media, and biohazard waste



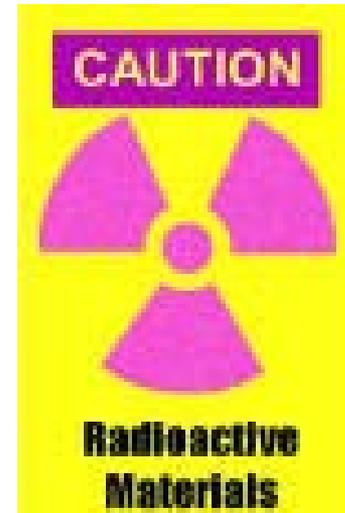
What can be Autoclaved?

- **Pathogenic plant matter**
- **Culture and stocks of infectious agents (bacteria, mold, viruses)**
- **Contaminated solids (paper towel, cloth, plastic pipette tips, glassware)**
- **Discarded live and attenuated vaccines**
- **Recombinant DNA, plant and animal specimens**
- **Animal tissues**
- **Animal cage waste**



What should NOT be Autoclaved?

- Items containing solvents, volatiles or corrosive chemicals
- Radioactive material (s)



Autoclave Safety Procedures

- Follow manufacturers' guidelines
- Do not open when chamber is pressurized
- Avoid standing directly in front of autoclave door when opening
- Divide and Conquer
 - Divide small volumes into small
 - Autoclaving dense materials is not recommended
- Do not place sealed containers into autoclave
- Careful - liquids are hot
- Use shallow metal pans for best results and heat transfer
- Place autoclave on preventive maintenance schedule to ensure it is working according to specifications of the manufacturer
 - Annual inspection by manufacturer-certified technician



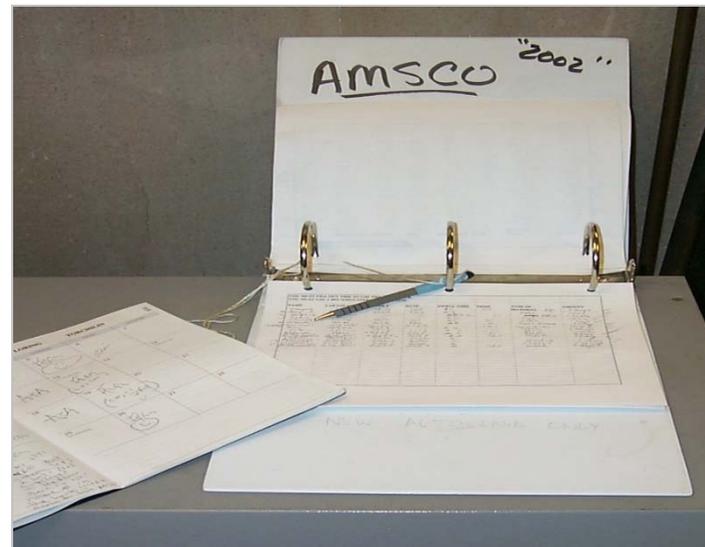
Biological Indicators for Autoclaves

- When the bioburden is unknown, the most appropriate method to validate sterilization is the overkill method.
- This method involves demonstrating that 10^6 spores (*Geobacillus stearothermophilus*) will be killed in a half cycle.
- Thus a full cycle would result in a 12-log reduction of spores and produce a **sterility assurance level (SAL)** of 10^{-6} or a one-in-a-million chance of a non-sterile sample.
- Monitoring of biohazard waste using biological indicators should be performed weekly



Record Keeping for Autoclaves

- **Record all information in a Log book**
 - Name
 - Laboratory Location
 - Phone Number
 - Date
 - Dwell Time
 - Temperature
 - Type and amount of material



Cleaning Autoclaves

- **Clean trap at least once a week**
- **Clean surrounding area after every use**
- **Remove broken glass**
- **Clean up overflowing liquids immediately**



Area Decontamination

Area Decontamination

- Vapor Phase Hydrogen Peroxide (VHP)
- Formaldehyde Vapor
- Chlorine Dioxide



CSCHAH, Winnipeg, Canada



AMSCO VHP 1000

Vaporized Hydrogen Peroxide Generator

Front View

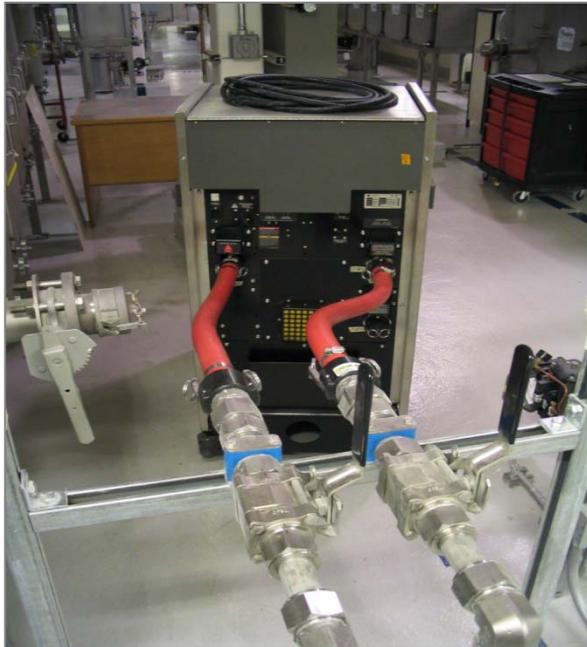
- Control Panel
- Printer
- Sterilant Cartridge
- Break release
- Warning Lights



CSCAH, Winnipeg, Canada

Connections outside Containment

Connect to Room via external piping



Connections inside Containment



CSCHAH, Winnipeg, Canada

- Piping in room
- Ability to Connect:
 - Pass through
 - Class III BSC
 - Extension hose for room decontamination

Chlorine Dioxide - Alternative Sterilant



Cloridox-B or GMP Sterilization System

Alfa Medical, Hempstead, NY



ClO₂ Generator System
(up to 100,000 pounds of ClO₂/ day)

Sabre Technical Services, Reston, VA

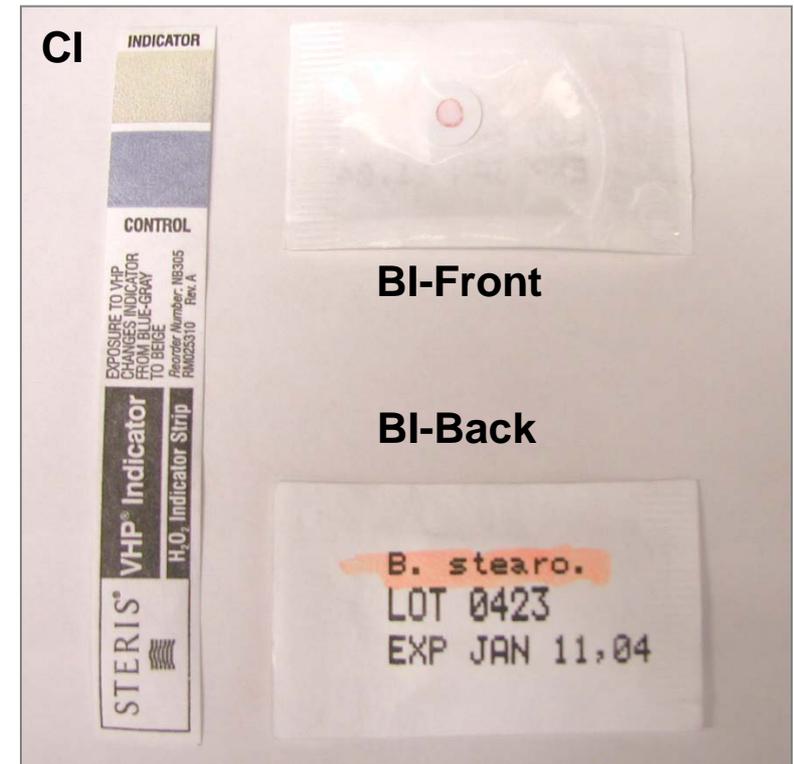
Biological and Chemical Indicators (VHP)

- **Chemical Indicators (CI)**

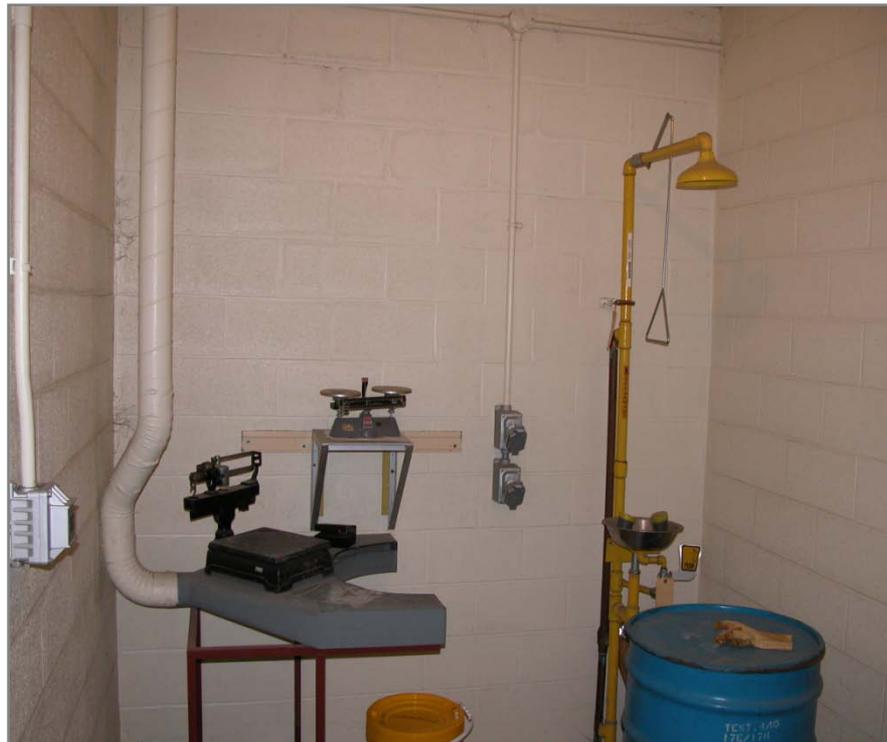
- VHP® Indicator from STERIS
- Change color from blue/grey to beige when exposed to Hydrogen Peroxide Vapors

- **Biological Indicator (BI)**

- Spordex®-VHP™ from STERIS
- *Geobacillus stearothermophilus*
- Population of 10⁵



Formaldehyde Decontamination Chemicals



Facility Decontamination Validation (HCHO)



Canadian Science
Centre for Human
and Animal Health

Centre scientifique
canadien de santé
humaine et animale

Biological Waste

Types of Biological Waste



- **Solid, non-sharp waste**

- Plastic labware (flasks, tubes, plates, bottles, vials)
- Lab waste (stocks, specimens, cultures, swabs)
- Tissue or carcass waste (pathological)
- Gloves, apparel, wipes
- Pipettes (could also be sharps!)



- **Liquids**

- Aspirates, culture fluids, rinses, washes, etc.
- Sera, body fluids
- Spill clean-up waste



- **Sharps**

- Anything with a point or edge capable of piercing or cutting human skin
- Glass labware (sometimes also broken plastic)
- Needles, scalpels, blood tubes, Pasteur Pipettes
- Syringes (*with* and sometimes *without* needles)



Solid Biowaste Collection



Waste Storage and Transport





Intermediate vs. Final Treatment

- **Intermediate Treatment**
 - Usually performed for worker protection
 - Autoclaving most common method
 - Standard microbiology lab practice
 - Performed before transport to final treatment
- **Final Treatment**
 - On-site treatment by facility staff
 - Off-site treatment by disposal contractor



Summary

- Decontamination is disinfection or sterilization of infected articles to make them suitable for use or disposal.
- Disinfection is the selective elimination of certain undesirable microorganisms in order to prevent their transmission.
- The effectiveness of a germicide (disinfectant) is dependent upon the concentration of the germicide, concentration of the agent, the type of agent, the time of contact, and the environmental conditions present.
- The effectiveness of any decontamination process should be validated.
- Autoclave = Pressure vessel
 - **Heat hazard; distribution of load**
 - **Preventive maintenance schedule**
 - **Use chemical indicators and biological indicators**
- There are different procedures for surface and area decontamination
 - **Choice of disinfectants for surfaces**
 - **Formaldehyde vapor or Vaporized Hydrogen Peroxide for areas**
 - **ALL decontamination procedures must be validated**
- Types of biological waste, disposal