

Autoclaves

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Outline

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- Safety Features
- Chemical/Biological Indicators
- Efficacy Monitoring
- Autoclaving - Preparation, Procedure, Completion
- Safety Precautions
- Routine Maintenance
- Q & A

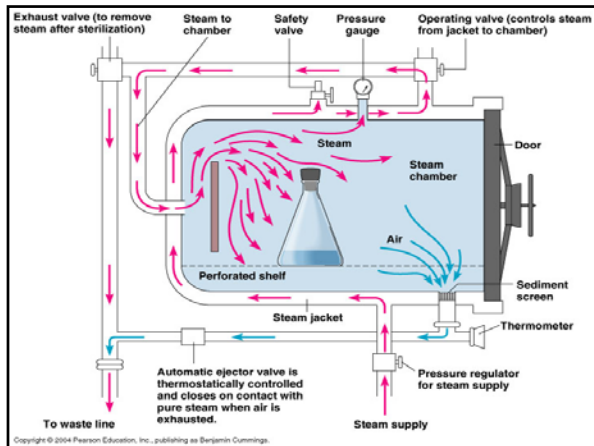


Definitions

Autoclave:

- an instrument that maintains saturated steam for period of time at high temp & under pressure
- used to sterilize lab equipment and materials by destroying potentially infectious agents







Definitions

Types of autoclaves

Gravity:

- most common
- steam pumped into top of chamber
- air forced out bottom during conditioning phase

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Definitions

Types of autoclaves

Pre-vacuum:

- uses a vacuum pump to remove air from chamber prior to sterilization
- steam able to penetrate all surfaces within the chamber
- post-vacuum drying phase ensures dryness

Definitions

Autoclave cycles:

1) Unwrapped

- for items that are not packaged
- uses a gravity assist during conditioning & exhaust phase or exhaust phase only to displace air



Definitions

Autoclave cycles:

2) Wrapped

- for items that may be 'packaged' or waste in biohazard bags
- uses a vacuum pulse during conditioning phase
- cycles the temperature & allows for removal of air pockets
- employs a gravity-type exhaust



Definitions

Autoclave cycles:

3) Liquids

- for liquids or mixed loads
- gravity assist during conditioning phase
- pressure gradually decreased during exhaust phase to prevent 'bump'



Definitions

Autoclave Cycle Phases

Usually consists of 3 phases:

- conditioning
- exposure
- exhaust

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Definitions

Autoclave Cycle Phases

Conditioning:

- first phase
- steam enters chamber & conditions load
- air displaced through chamber drain

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Definitions

Autoclave Cycle Phases

Exposure:

- steam processes load at selected time & temp
- effects kill of infectious agents

Definitions

Autoclave Cycle Phases

Exhaust:

- steam is removed from chamber & pressure released
- load is dried, if drying option selected

Chemical Indicators

Examples:

1) Autoclave Tape

- has heat-sensitive markings
- is **not** an indicator of sterility



2) Chemical Integrators, e.g. 3M Comply

- pack-control test for steam penetration

3) Steri-Vapeur 18

- used for prion decontamination cycles
- indicates that 134°C was reached for 4 or 18 minutes



Chemical Indicators

- only indicate that a certain temperature was reached, but does not tell you for how long
- not to be relied on solely to determine success of autoclave process for 121°C or 125°C runs
- certain types useful for prion loads where >134°C is used

Biological Indicators

- known population of spores (*Geobacillus stearothermophilus* – 1×10^6)
- used to monitor efficacy of decontamination process
- parameters of cycle tested via load testing with biological indicators

Biological Indicators

- must ensure materials have been decontaminated successfully
- must be used once per week in CL2 & on each load from CL3 & CL4
- thermocouples may also be used to monitor internal temp of load – used in conjunction with a biological indicator

Biological Indicators

Types:

1) Spore strips

- *Geobacillus stearothermophilus*

2) Rapid Indicators

- 48 hour growth
- enzymatic reaction plus 48 hour growth

Biological Indicators

1) Spore strips

- filter paper strip impregnated with spores contained in glassine envelope
- *G. stearothermophilus*
- usually 10^6 organisms/strip



Biological Indicators

1) Spore strips (cont'd)

- must have laminar flow hood or BSC
- must have person trained in aseptic technique to transfer/grow
- results in 3 to 7 days
- not best for use with steam sterilization



Biological Indicators

2) Rapid indicators (48h)

Equipment needed:

- self-contained biological indicators
- dedicated heating block incubator
- quicker results & easy to use



Biological Indicators

3) Rapid indicators – Enzyme-based (3h)

Equipment needed:

- self-contained biological indicators
- dedicated heating block incubator



Biological Indicators

3) Rapid indicators – Enzyme-based (3h) (cont'd)

- third generation biological indicator system
- detects alpha-D-glucosidase upon growth of spores (3h)



Biological Indicators

3) Rapid indicators – Enzyme-based (3h) (cont'd)

- bacteria growth detected in 48 hours
- quicker & easier to use than spore strips



Efficacy Monitoring

- place indicators in the center of the load, i.e. where steam penetration will be challenged



Efficacy Monitoring

- initial testing of representative loads at differing times & temps to determine standards run parameters to effect complete kill of spore load
- efficacy of process to be tested at least once/week for CL2 and every load from CL3 & CL4

Efficacy Monitoring

Failure to achieve sterilization may be due to:

- improper loading or overloading
- insufficient sterilization time at that temperature

Preparation for Autoclaving

- caps or enclosures must be loosened
- flasks of liquids may be covered with cotton plugs or foil
- flasks of liquids – not more than 2/3 full
- biohazard bags – not more than 2/3 full & contained in a stainless steel bin

Preparation for Autoclaving

- biological indicator placed in center of load
- open bags & loosen caps before autoclaving
- use liquid cycle for mixed loads

Preparation for Autoclaving



Preparation for Autoclaving



Autoclaving Procedure

- don appropriate PPE
- load autoclave
- seal door
- check process parameters on autoclave
- start process

Completion of Autoclave Run

- check for warning lights/codes on autoclave & printout



- check autoclave tape for verification that set parameters were reached



Completion of Autoclave Run

- don appropriate PPE
- open door, allowing steam to vent
- allow autoclave to cool before removing contents

Completion of Autoclave Run

- remove biological indicators
- record information in log book
- incubate
- material autoclaved should be quarantined until bio indicator results read & negative



Completion of Autoclave Run

If biological indicator fails:

- check packing/loading of materials
- check temperature/time combination
- load must be re-run until successful biological indicator results are obtained

Safety Precautions

- appropriate PPE and first aid supplies must be readily available
- wear protective clothing when removing contents – heat-resistant gloves, safety glasses/goggles
- stand away from the door to minimize risk of burns & steam inhalation during door release

Safety Precautions



Safety Precautions

- care in packing, loading & cycle selection will minimize chances of boil-overs, explosions, broken glass, etc.
- any leaks or malfunctions must be reported immediately to service personnel

Safety Precautions

Do NOT autoclave:

- volatile or chlorinated chemicals
- radioactive materials
- compressed gases
- items sensitive to heat, moisture or pressure

Routine Maintenance

- clean sediment screen/chamber drain strainer
- clean exterior surfaces & accessory equipment
- the interior chamber using mild detergent & water



Routine Maintenance

- inspect door seal/gasket – call service if repair required
- change the printer paper roll/ink cartridge or pen when necessary
- all other maintenance & repairs should be done by qualified service personnel

Thank you!!