

Biological and Infectious Waste

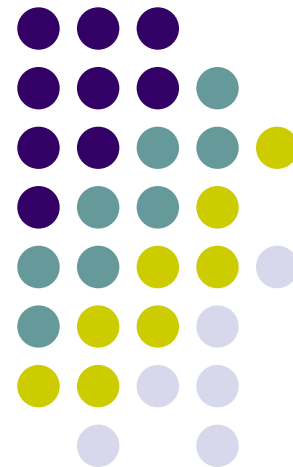
Matthew Duff
Biosafety Specialist
DEHS-Biosafety
612-626-6002
duff0108@umn.edu
www.dehs.umn.edu

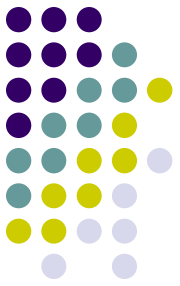


Department of
Environmental
Health & Safety



UNIVERSITY OF MINNESOTA





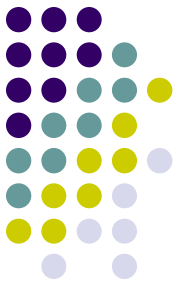
This training will cover the following:

- The different types of biological waste generated at the University of Minnesota
- How to properly handle biological waste
- What personal protective equipment (PPE) is required for handling biological waste
- Methods of disposal of biological waste
- Autoclave use and maintenance

First, a little background...



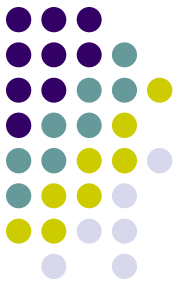
Why should you be so concerned about biological and infectious wastes? Doesn't the University handle wastes?



NOT SO FAST!

- The laws that govern hazardous wastes can be confusing, but ultimately the people responsible for hazardous wastes are the people who generate them – YOU!
- We at DEHS write up plans and training sessions to help researchers navigate the confusing world of these regulations

The University Infectious Waste Plan



- Minnesota state law requires a plan for the control of infectious wastes
 - Minnesota Statutes 2007, Chapter 116.76 – 116.82 of the *Infectious Waste Control Act*
- Biological and infectious wastes are types of hazardous wastes.
- Biological wastes may be mixed with other hazardous wastes.
 - This requires special handling procedures

So what are “biological and infectious wastes”?



- Cultures and stocks of infectious agents
- Contaminated items used to inoculate, transfer or manipulate cultures of infectious agents



So what are “biological and infectious wastes”? Cont’d...



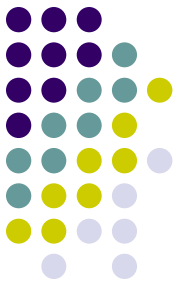
- Wastes from the production of infectious agents
- Discarded live or attenuated vaccines that are infectious to humans
- Recombinant DNA waste

So what are “biological and infectious wastes”? Cont’d...



- Blood and regulated body fluids
- All types of pathological waste
- Research animal waste
- Sharps

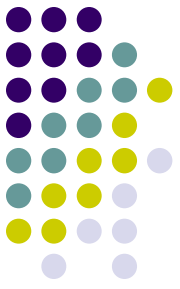
Personal Protective Equipment



- Gloves are a necessity when working with potentially infectious substances
- A lab coat should be worn to protect your body and removed when leaving containment
- Safety glasses or a face shield may be required to prevent splatter into the eyes



Segregation and Labeling containers



- Generators of waste are responsible for all handling of waste until the waste is secured by the waste contractor
- Generators must ensure waste is properly segregated, containerized, labeled, and, if appropriate, decontaminated before being picked up by the waste contractor
- Infectious waste and sharps must be segregated from all other waste



Segregation and Labeling containers cont'd



- Such waste must be properly containerized
- Waste bags and containers must be handled in a such a way as to prevent breaks, spills, or leaks

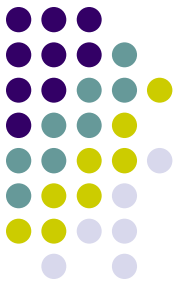


Containers for On-site Decontamination



- Infectious waste that will be decontaminated by autoclaving must be collected in sturdy, leak-proof outer containers
 - Easy to decontaminate
 - Must have a lid that can be fastened to prevent spillage
- The receptacle should be lined with a clear autoclavable bag
- After autoclaving, clear waste bags can be disposed of in the regular waste stream
- More info on autoclaving will be presented later

Containers for Off-site Decontamination



- Outer container must be sturdy and leak-proof
 - Must be easily decontaminated
 - Must have a lid that can be fastened to prevent spillage
- Outer container must be lined with a red plastic biohazard bag



Containers for Off-site Decontamination cont'd



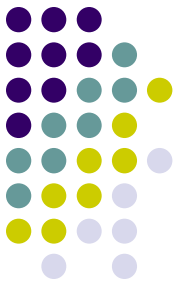
- Both outer container and bag will clearly be labeled with a biohazard symbol or the words “Infectious Waste”
- Waste generators will tightly seal red biohazard bags when no more than $\frac{3}{4}$ full and place in designated area of lab for pick up
- Properly trained custodians will transfer red bags and sharps containers from labs to storage areas for hauler pick up

Containers for Off-site Decontamination cont'd



- These storage areas are segregated from other waste storage areas
 - Have secure access
 - Are constructed of easily cleanable materials

NOTE: Red biohazard bags or other bags with a biohazard symbol, even if autoclaved, can not be disposed of as “normal waste”.

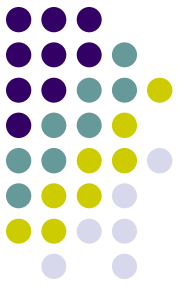


Prion Waste

- Prion waste will be placed in yellow barrels lined with yellow biohazard bags
- Call FM for disposal

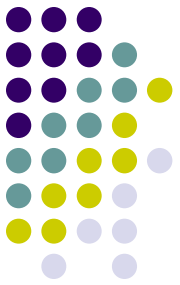


Sharps Containers



- NEVER placed in normal waste stream
- Not used for any other purpose than sharps disposal

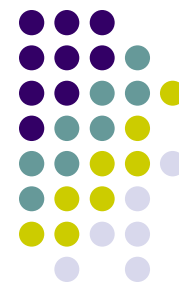




Sharps Containers Cont'd

- Will be:
 - Puncture resistant
 - Leak proof
 - Clearly marked with biohazard symbol
 - Within easy reach of work station
 - Filled to no more than $\frac{3}{4}$ capacity
 - Sealed (capped or taped) prior to transport





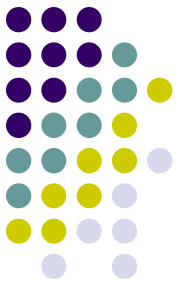
Spills and accidental exposures

- Spills will be cleaned up as described in the Biohazards and Toxin Decontamination & Spill Clean-up Fact Sheet:
<http://www.dehs.umn.edu/PDFs/chemical/Decontaminate.pdf>

Accidental exposures

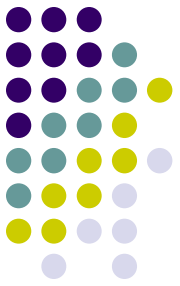


- For urgent care all employees should report to [HealthPartners](#) Occupational and Environmental Medicine (M/F day time or Urgent Care after hours), or [UMMC-Fairview Hospital](#) (24 hrs). You may seek medical attention at the closest available medical facility or your own healthcare provider.
- All occupational health follow up is to be performed with Health Partners where an accident report will be filled out



Research animal waste

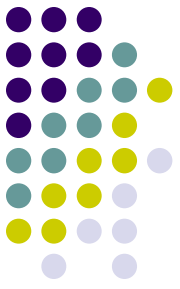
- Small animal carcasses and tissues are to be placed in red biohazard bags, which are in turn placed in designated coolers until hauler pick up
- Large animal carcasses/tissue are disposed of in the tissue digester on the St. Paul campus
- Bedding/waste from caged infected animals will be treated by autoclaving onsite



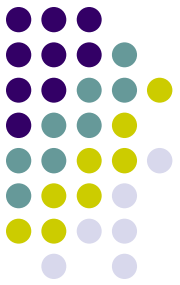
Human pathological waste

- All human pathological waste is handled by the University's Bequest Program, where it is sent to a contractor for cremation
- Fixed tissue is removed from preservative before transfer to the Bequest Program
 - Chemical preservatives will be disposed of as hazardous chemical waste

And now we have autoclaves...

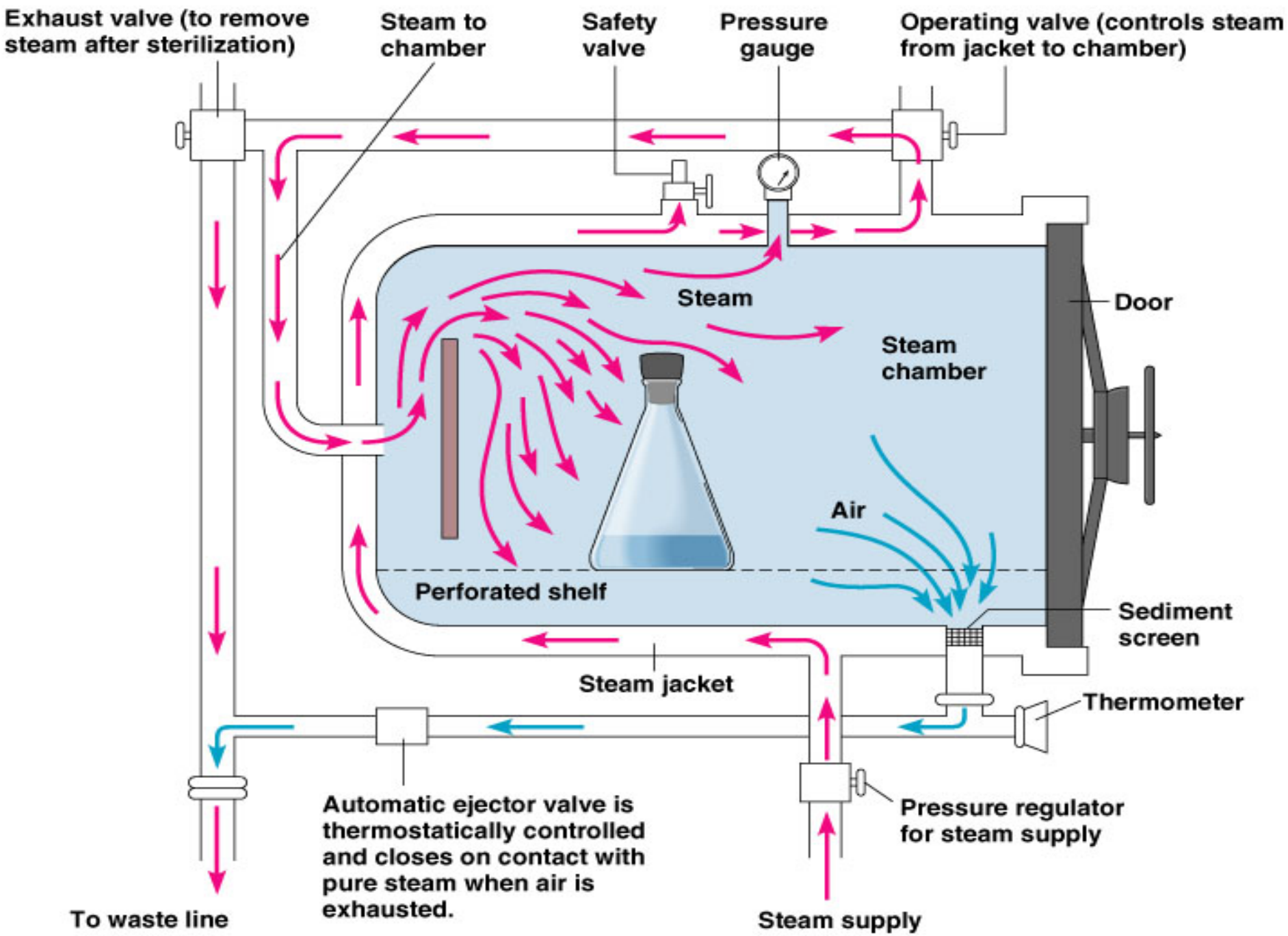


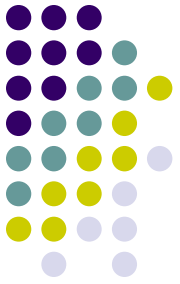
- An effective method for eliminating biohazardous waste
- Once autoclaved, waste bags can be disposed of in the regular trash, meaning it is cheaper than red bags
 - NOTE- autoclave bags must be used: no biohazard symbol
- Can also be used to sterilize liquid infectious wastes – preferred over bleach



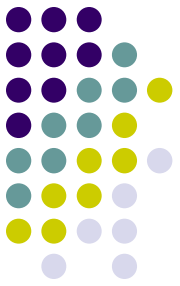
Method of action

- Autoclaves use saturated steam under heat and pressure for a period of time known to kill, destroy, or deactivate bacteria, viruses, fungi, and spores





Types of Autoclaves



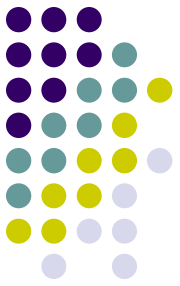
- Gravity
 - most common
 - must clean port and basket before use/frequently
 - steam pumped into top of chamber
 - air forced out bottom during conditioning phase
- Pre-vacuum
 - uses a vacuum pump to remove air from chamber prior to sterilization
 - steam able to penetrate all surfaces within the chamber
 - post-vacuum drying phase ensures dryness



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



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







Autoclave cycles

3. Liquids

- For liquid or mixed loads
- Gravity assist during conditioning phase
- Pressure gradually decreased during exhaust phase to prevent 'bump'



White cap on the neck of the left flask.

Brown paper cap on the neck of the middle flask.

Brown paper cap on the neck of the right flask with handwritten label '11.01'.

3000 ml
30055
Mar Conky

6000 ml
PYSEK
No. 4080
PYREX

6000

4000

3000

2000

6000 ml

5000

4000

6000

5000

4000

3000

2000



Autoclave cycle phases

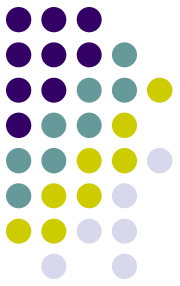
There are three:

- Conditioning
- Exposure
- Exhaust



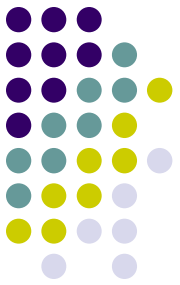
Conditioning phase

- First phase
- Steam enters chamber and conditions load
- Air displaced through chamber drain



Exposure phase

- Steam processes the load at the selected time and temperature
- This is the “kill” phase – the effects here are what kill the infectious agents in the load



Exhaust phase

- Steam is removed from chamber
- Pressure is released
- Load is dried if drying option is selected



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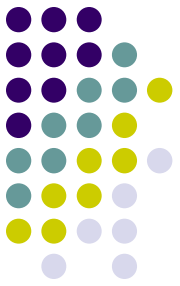


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Chemical indicators

1. Autoclave tape
 - Heat-sensitive marking
 - 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
 - Indicates 134°C reached for 4 or 18 minutes



Spore strips – a biological indicator

- 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

Rapid indicators – another biological indicator



Two types of these:

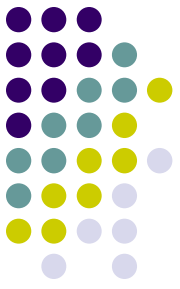
- 48 hour growth
- Enzymatic reaction and 48 hour growth



Efficacy monitoring

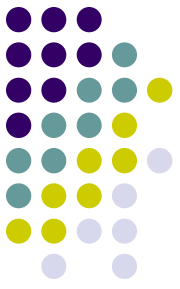
Indicators should be placed in the center of the load, where steam penetration faces its greatest challenge





Sterilization failure

- May be due to improper loading or overloading, or misuse of autoclave
- Insufficient amount of time at sterilization temperature
- Autoclave didn't reach sufficient temperature or pressure
- Sealed flasks
- Full basket
- Operator lacks proper autoclave training

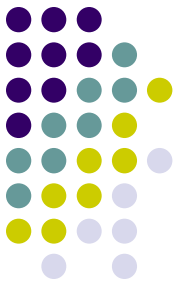


Autoclaving preparation

- Caps must be loosened
- Flasks of liquids must not be more than 2/3 full
- Autoclave bags must not be more than $\frac{3}{4}$ full, and must be in an autoclave-safe bin
- Biological indicator must be placed in center of load



Completion of autoclave run



- Open door and allow steam to vent
- Allow autoclave to cool before removing items
- Remove biological indicators



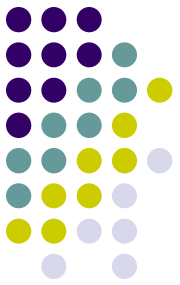
Autoclave maintenance

- Clean sediment screen/chamber drain strainer
- Clean exterior surfaces
- Clean interior surfaces using a mild detergent
- Inspect door seal/gasket
- All other maintenance should be done by qualified personnel



In summary....

- Biological and infectious waste at the U of M can be confusing
- If you generate waste, you are responsible for the waste
- Red biohazard bags or autoclaving can be used to eliminate biohazardous waste, but autoclaving is preferred
- If you have any questions or waste-related issues, DEHS can and will help!

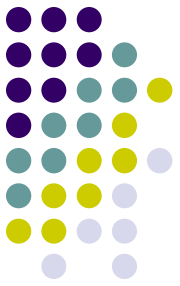


Questions or comments?

Contact DEHS at:

dehs@umn.edu

612-626-6002



Thank you and have a great day!

