

# Pathogen Containment

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Firstly we'll start by addressing what we are trying to contain, a pathogen. The word Pathogen comes from the Greek 'path' "suffering" and 'gen' "to give birth to". A pathogen is an infection biological agent that can cause a wide variety of ailments and diseases to its host. There are four types of biological elements that are considered to be pathogens. The first are viruses, which are dormant until inside of a host which they then can use to reproduce. Bacterial or bacteria, are living cell organisms that can reproduce on their own. Fungal pathogens are eukaryotic organisms that can reproduce without the need of a host. Lastly is Prionic, a Prion is a malformed protein chain that can cause brain disease and encephalitis. Some notable pathogens are the infamous black plague, Malaria, HIV, Tuberculosis, Salmonella, Syphilis, and Ebola.

A theory of testing the severity of a pathogen is by how long it can survive outside of a host. For example Smallpox with at 90% fatality rate can survive outside of host for ca 885 days. Compare that to Tuberculosis which can last about 224 day with at fatality rate of 80%. Given the range of severity of pathogens, certain precautions must be taken to safely handle them. There are four biological safety levels, 1 least concerning and 4 being of high treat to human health.

The pathogen agents in level one are known not to harm or have any effect on humans. The lab does not need to be separated from any other part of the building. Safety protection is simply wearing latex (or something of the like) gloves and face protection. All surfaces are cleaned with antibacterial soap and all tools are autoclaves.

Agents in level 2 pose moderate threat to a healthy adult, and viruses that "are difficult to contract via aerosol in a lab setting." Also in this level is any genetically modified or created organism (such as GM food). Safety and clean up is the same as level one, with the exceptions such as: that lab personnel has special training and watched by scientists with advanced training in pathogen safety. Lab access is limited to when work is being done.

Level 3 agents can be fatal or severe to host, but vaccines and or treatments are available. Special

training in handling lethal pathogens is required, and work is supervised. The Lab setup is required to have: All airflow leaving the lab is filter and discharged to the outdoors, Access to lab is restricted when in use.

The agents in level 4 have high aerosol transmission, which can be serve or fatal to humans and there is no available treatment or vaccine. All personnel is to wear a full hazmat suit and self-contained oxygen supply. The lab is required to have: A shower room, Ultra violet room, in order to destroy any pathogen before exiting. All materials (air, water) undergo decontamination upon entry and exit. Doors, and airways are controlled to not be open concurrently. The lab itself is separated from any other, and is kept under a negative pressure.

An Autoclave is a device used to sterilize lab utensils and equipment that have been used around contaminants. The autoclave cleans by removing all air and cleaning compartment with high pressure steam at 121°C ~ 250°F.

A Fume hood or fume cabinet, is a closed box with one open face. Air is pulled from the outside into the cabinet, cleaned and then released back outside.

Hazmat suits are full suits that covers the body in its entirety in combination with a respiratory system can act as an independent self contained environment. A glove box is sealed box self contained from the outside. On one or more sides of the box are built in gloves. The air inside can be either removed or replace depending on need.

## Work Cited

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