

Biocontainment

The research community routinely studies hazardous biological agents to learn more about how they function and how they can be controlled. These studies over the years have led to the development of vaccines, sterilization techniques and an overall reduction in the risk to the general public from these microorganisms. In order to study them in a safe manner, special procedures have been developed and implemented to control these biological agents. One such state-of-the-art facility is the Biocontainment Suite operated by the U.S. Environmental Protection Agency, Office of Research and Development located in Cincinnati, Ohio. This and other facilities across the nation are designed and classified by the type of biological agent that may be studied, to ensure that sufficient controls are in place prior to the introduction of any specific microorganism. This research is needed to better understand how these agents can be detected and controlled in our environment so that we can more effectively protect ourselves from them. The importance of this research is more critical than ever before to ensure that our water, buildings and air will be safe in the event of a deliberate attempt to expose the public to potentially dangerous biological agents.

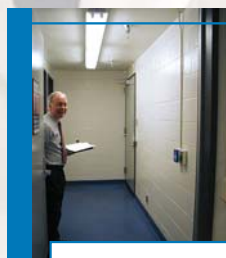
Biological agents are classified into the following groups:

- Class 1: Agents of no or minimal hazard under ordinary conditions of handling.
- Class 2: Agents of ordinary potential hazard.
- Class 3: Agents involving special hazard, including pathogens that are known or reasonably suspected to cause disease in humans or animals.
- Class 4: Agents that require the most stringent conditions for their containment because they are extremely hazardous to laboratory personnel or may cause serious epidemic disease.

The Biocontainment Suite at the U.S. EPA is designed and approved to study the impacts of biological agents up to and including those within Class 3, and therefore has a biocontainment safety level (BSL) rating of 3 (BSL3).

Safety

To ensure the safety of the employees and the public during the study of these biological agents, the U.S. EPA follows strict policies and procedures in their storage, use, and disposal. First, the facility itself is specially designed with one-pass air ventilation, negative air pressure to the rest of the facility, air-locks, and high efficiency air purification to ensure that these agents are controlled and not released to the building or the community. Second, the facility is isolated from personnel not trained or approved to work in the area. Third, all personnel are required to follow strict policies and procedures to ensure that the use of all pathogens is closely controlled and minimized. Lastly, all materials, equipment and waste leaving the Biocontainment Suite are sterilized to ensure that no hazardous biological agent is transported from the facility. The facility was designed and constructed with safety measures to conduct research at BSL3. The U.S. EPA is continually reviewing new information and technology developments to ensure that the facility is maintained in a configuration safe both for the workers and the public.



Biocontainment Suite Airlock
Inward airflow and an airlock system ensure that air passes only into the Biocontainment Suite.



Preparatory Kitchen
Reagents and culture media are prepared in this confined area. Strict adherence to established microbiological protocols throughout the preparation process ensures accurate, uncompromised assay results.



Interior Access Hall
Each research module can be entered from the Interior Access Hall. This design feature helps prevent microorganisms cultured in one module from contaminating assays being run in other modules.



Sample Reception Laboratory
Once logged in and given identification numbers in the Sample Reception Laboratory, microbiological samples can be tracked throughout the evaluation process.



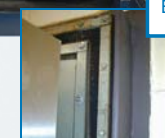
Sample Pass-Through Portal
Sample containment is enhanced by the ability to pass samples from the Sample Reception Laboratory to the Analytical Laboratory through the Sample Pass-Through Portal.



Analytical Laboratory
In the Analytical Laboratory, samples are processed and microorganisms are identified through a battery of test assays.



Autoclave
The facility's autoclave is a unique piece of equipment because it accepts contaminated instruments on the BSL3 suite side, sterilizes the instruments with pressurized steam, and allows extraction of sterilized instruments outside the suite. A rubber bioseal around the Autoclave helps assure containment of BSL3 agents within the Biocontainment Suite.



Bioseal

Design requirements for BSL3 facilities include:
Isolated area within the building
Restricted, controlled access through two self-closing doors
Walls, ceilings and floors impermeable to liquids
Sealed wall, ceiling and floor penetrations (such as utilities)
Method for decontamination of all wastes
Single pass, HEPA filtered ventilation system with inward airflow

Additional Safety Measures Employed in the Cincinnati BSL3 Suite include:

- Experienced staff
- Isolated, interior access hall
- Sample pass-through portals
- Double door, interlocking system autoclave with rubber bioseal
- UV light decontamination
- Double HEPA filtration of all exhaust air
- Liquid waste disinfection tank
- Electronic record-keeping system

Biosafety Cabinet

Room air is passed through HEPA filters within the biosafety cabinets. Particles (shown in red in the diagram) are removed from cabinet air and room air, thereby helping assure containment of BSL3 agents.



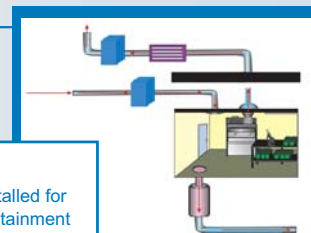
Ultraviolet (UV) Lights

Bactericidal UV lights expose all surfaces to germicidal radiation. This feature is above and beyond what is required by CDC.



Additional Safety

Supplemental devices installed for the EPA Cincinnati Biocontainment Suite ensure maximum containment and safety. These measures go beyond CDC requirements for a BSL3 research laboratory.



Disinfection Tank

Liquids entering the sinks and floor drains are collected and disinfected by boiling in the disinfection tank prior to release into sewers.



HEPA Filters

Airborne particles 0.3 microns or larger in size are trapped by HEPA Filters. The EPA Cincinnati Biocontainment Suite has the required filters in its biosafety cabinets; additional filters have been installed in exhaust ducts for increased safety.

