



**CONSOLIDATED
STERILIZER SYSTEMS**

Laboratory Biosafety Level Checklist & Microbe Guide





BSL-1

A BSL-1 lab houses activities that require only standard microbial practices. These include:

Laboratory practices

- ✓ Work should be performed on an open lab bench or table
- ✓ Spills must be decontaminated immediately
- ✓ Infectious materials must be decontaminated prior to disposal, generally through the use of an autoclave

Safety equipment

- ✓ Personal protective equipment such as lab coats, gloves and eye protection should be worn as needed

Facility construction

- ✓ A sink must be available for hand washing
- ✓ The lab should have doors to separate the working space from the rest of the facility

Organisms Commonly Associated with BSL-1 Labs

E. coli - Escherichia coli

E. coli are bacteria found in the environment, foods and intestines of people and animals. E. coli are a large and diverse group of bacteria. While most strains of E. coli are harmless, others can make you sick and can cause diarrhea, urinary tract infections, respiratory illnesses, pneumonia and other illnesses.



BSL-2

Personnel working in BSL-2 labs are expected to take even greater care to prevent injuries such as cuts and other breaches of the skin, as well as ingestion and mucous membrane exposures. Outside personnel are often restricted from entering when work is being conducted. The following practices are required in a BSL-2 lab setting:

Laboratory practices

- ✓ Restricted access to the laboratory when work is being conducted

Safety equipment

- ✓ Appropriate personal protective equipment (PPE) is worn, including lab coats and gloves
- ✓ Eye protection and face shields should also be worn
- ✓ Procedures that cause infection from aerosols/splashes are done within a biological safety cabinet (BSC)
- ✓ An autoclave or an alternative method of decontamination is available for proper disposals

Facility construction

- ✓ The laboratory should have self-closing doors
- ✓ A sink and eyewash should be readily available

Organisms Commonly Associated with BSL-2 Labs

Eastern Equine Encephalitis (EEE)

Eastern equine encephalitis virus is transmitted to humans by the bite of an infected mosquito. If untreated, the illness can progress into disorientation, seizures or coma.

Human Immunodeficiency Virus (HIV)

Human Immunodeficiency Virus weakens a person's immune system by destroying important cells that fight disease and infection. Currently there is no cure for HIV.

Staphylococcus Aureus (Staph infections)

Staphylococcus aureus is a type of bacteria that about 30% of people carry in their noses. Most of the time, staph does not cause any harm; however, sometimes staph causes infections. In healthcare settings, these infections can be serious or fatal.



BSL-3

In addition to the aforementioned safety practices, personnel working in a BSL-3 lab are also under medical surveillance and could receive immunizations for microbes they work with. In addition to BSL-2 expectations, the following are common practices in a BSL-3 laboratory:

Laboratory practices

- ✓ Access to the laboratory is restricted and controlled at all times

Safety equipment

- ✓ Appropriate PPE must be worn, and respirators may be required
- ✓ All work with microbes must be performed within an appropriate BSC

Facility construction

- ✓ A hands-free sink and eyewash station are available near the exit
- ✓ Exhaust air cannot be recirculated, and the laboratory must have sustained directional airflow by drawing air into the laboratory from clean areas towards potentially contaminated areas
- ✓ Entrance to the lab is through two sets of self-closing and locking doors

Organisms Commonly Associated with BSL-3 Labs

Yellow Fever

Yellow fever virus, which is found in tropical and subtropical areas in South America and Africa, is transmitted to people by the bite of an infected mosquito. Yellow fever is very rare. Illness ranges in severity from a self-limited febrile illness to severe liver disease with bleeding.

West Nile Virus (WNV)

West Nile is most commonly transmitted to humans by mosquitoes. There are currently no medications to treat or vaccines to prevent WNV infection. Most people infected with WNV have no symptoms, however about 1 in 5 people who are infected will develop a fever with other symptoms. Less than 1% of infected people develop a serious, sometimes fatal, neurologic illness.

Tuberculosis (TB)

Tuberculosis (TB) is caused by a bacterium called *Mycobacterium tuberculosis*. The bacteria usually attacks the lungs, but TB bacteria can attack any part of the body such as the kidney, spine and brain. Not everyone infected with TB bacteria becomes sick.



BSL-4

BSL-4 labs are the highest level of biological safety. There are a small number of BSL-4 labs in the United States and around the world. In addition to the aforementioned BSL-3 lab requirements, common practices in a BSL-4 laboratory include:

Laboratory practices

- ✓ Change clothing before entering/shower upon exiting
- ✓ Decontaminate all materials before exiting

Safety equipment

- ✓ All work with the microbe must be performed within an appropriate Class III BSC, or by wearing a full body, air-supplied, positive pressure suit

Facility construction

- ✓ The laboratory is in a separate building or in an isolated and restricted zone of the building
- ✓ The laboratory has dedicated supply and exhaust air, as well as vacuum lines and decontamination systems

Organisms Commonly Associated with BSL-4 Labs

Ebola

Ebola, previously known as Ebola hemorrhagic fever, is a rare and deadly disease caused by infection with one of the Ebola virus species. Humans may spread the virus to other humans through contact with bodily fluids such as blood. Initial symptoms include fever, headache, muscle pain and chills. Later, a person may experience internal bleeding resulting in vomiting or coughing blood, or even death.

Marburg Viruses

Marburg hemorrhagic fever is a rare but severe hemorrhagic fever which affects both humans and non-human primates. Marburg HF is caused by the Marburg virus, a genetically unique zoonotic (or, animal-borne) RNA virus of the filovirus family.



Quick-Reference Biosafety Level Chart

Knowing the difference in biosafety lab levels and their corresponding safety requirements is imperative for anyone working with microbes in a lab setting.

For a comprehensive list of safety practices, equipment and lab facility requirements, please reference the full list of safety criteria designated by the Centers for Disease Control and Prevention.

Biosafety Level	BSL-1	BSL-2	BSL-3	BSL-4
Description	<ul style="list-style-type: none"> No Containment Defined Organisms Unlikely to cause disease 	<ul style="list-style-type: none"> Containment Moderate Risk Disease of varying severity 	<ul style="list-style-type: none"> High Containment Aerosol Transmission Serious/Potentially lethal disease 	<ul style="list-style-type: none"> Max Containment “Exotic” High-Risk Agents Life-threatening disease
Sample Organisms	<ul style="list-style-type: none"> E.Coli 	<ul style="list-style-type: none"> Staphylococcus Aureus (Staph infections) HIV Eastern Equine Encephalitis (EEE) 	<ul style="list-style-type: none"> Yellow Fever West Nile Virus (WNV) Tuberculosis (TB) 	<ul style="list-style-type: none"> Ebola Virus Marburg Viruses
Pathogen Type	Agents that present minimal potential hazard to personnel & the environment.	Agents associated with human disease & pose moderate hazards to personnel & the environment.	Indigenous or exotic agents, agents that present a potential for aerosol transmission & agents causing serious or potentially lethal disease.	Dangerous & exotic agents that pose a high risk of aerosol transmitted laboratory infections & life-threatening disease.
Autoclave Requirements	None	None	Pass-thru autoclave with Bioseal required in laboratory room.	Pass-thru autoclave with Bioseal required in laboratory room.