

**Containment Facilities as explained in the Biosafety in Microbiological and Biomedical Laboratories  
of the US National Institutes of Health's Centers for Disease Control and Prevention**

Biosafety Level Abbreviation	Biosafety Level	Agents	Examples & details of agents	Special Practices	Primary Barrier and Personal Protective Equipment (PPE)	Facilities (Secondary Barriers)
<b>BSL3</b>	<i>Biosafety Level 3</i>	Indigenous or exotic agents; that may cause serious or potentially lethal disease through the inhalation route of exposure.	Mycobacterium tuberculosis, St. Louis encephalitis virus, and Coxiella burnetii are examples of biological agents that meet these criteria.	Access is limited to those with the need to enter; viable material is removed from the lab in primary and secondary containers; opened only in BSL-3 or ABSL-3 laboratories; all procedures with infectious materials are performed in a Biosafety Cabinet.	Biosafety Cabinets for all procedures with viable agents; solid front gowns, scrubs, or coveralls; two pairs of gloves, when appropriate; protective eyewear, respiratory protection, as needed.	Physical separation from access corridors; access through two consecutive self-closing doors; hands-free sink near the exit; windows are sealed; ducted air ventilation system with negative airflow into the lab; autoclave available, preferably in the laboratory.
<b>ABSL3 Ag</b>	<i>Animal Biosafety Level 3 Agriculture (1)</i>	Hazardous biological agents and toxins designated as High-Consequence Foreign Animal Diseases and Pests by the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) in large or loose-housed animals. This level should be considered for work with pathogens that affect agricultural animals and other animal species that cannot be housed in primary containment isolators or an equivalent means of primary containment following challenge.	The host range of these veterinary pathogens may be limited to animals, although some may also have zoonotic potential and could pose a risk to both animals and humans. The wide spectrum of animal species routinely used for agricultural research includes those found in commercial agricultural production facilities; commercial aquaculture; wildlife; and traditional laboratory animals.	Administrative controls and policies should limit contact between containment staff and susceptible animals outside the ABSL-3Ag containment space (i.e., personally recognizable quarantine policy based on site-specific risk assessment and regulatory requirements). Recommended a minimum of two workers to be present in the containment area at all times (i.e., a "buddy system"). Supplemental administrative controls that mitigate potential risks these agents pose to surrounding animal populations and the environment may be necessary.	Personnel may be required to use additional PPE based on site-specific risk assessment. Workers may be required to shower or wear extra PPE that can be surface-decontaminated upon exiting a primary containment room, followed by an additional shower before exiting the containment facility.	Personnel enters through a series of barriers that provide complete separation of potentially contaminated animals, materials, and equipment in the containment space from other areas of the building. Mechanically interlocked entry/exit vestibule doors or an equivalent mechanism or process. If necessary: HEPA filtration of exhaust air, engineering features that protect supply air against airflow reversals, installation of an effluent decontamination system (EDS) and supplemental engineering controls that mitigate potential risks these agents pose to surrounding animal populations and the environment.
	<i>Biosafety Level 3 + (plus) or enhanced</i>	Situations may arise for which enhancements to BSL3 lab practices and equipment are required. This is the case when	When performing diagnostic testing on specimens from patients with hemorrhagic fevers thought to be due to dengue or yellow fever viruses. When the <i>origin</i> of these	Additional appropriate training is recommended for all staff. Rigorous adherence to respiratory protection and clothing change protocols.	Enhanced respiratory protection of personnel against aerosols: Negative pressure, HEPA-filtered respirators and	HEPA filtration of exhaust air from the laboratory; and personal body shower upon exit. Including clothing change protocols.

BSL3+		works with some specific pathogens and practices.	specimens is Africa, the Middle East or South America, such specimens might contain etiologic agents, such as arenaviruses, filoviruses, or other viruses that are usually manipulated in a BSL4 lab. Examples of general practices would include using higher than normal volumes of culture, higher concentrations of culture, and/or production of aerosols. Also, some organisms require work at this containment (e.g., High Pathogenic Avian Influenza, 1918 Pandemic Influenza).	Develop and implement a specific medical surveillance and response plan; with annual vaccination when working with HPAI and LPAI A viruses that have infected humans; non-contemporary wild-type human influenza A viruses, including recombinants and reassortants; and viruses created by reverse genetics of extinct virus strains (e.g., 1918 strain).	eye protection, or positive air-purifying respirators.	
ABSL4	<i>Animal Biosafety Level 4</i>	Required for work with animals infected with dangerous and exotic agents that pose a high individual risk of aerosol-transmitted lab infections and life-threatening diseases, agents for which there are no vaccines or treatments, or work with a related agent with unknown risk of transmission.	Hemorrhagic fever viruses (such as Crimean-Congo hemorrhagic fever virus) and the new genus of Henipavirus in the Paramyxoviridae family (Nipah and Hendra viruses) <sup>2</sup> Agents with a close or identical antigenic relationship to agents requiring ABSL4 containment are handled at this level until sufficient data are obtained to re-designate the level.	Animal care staff: receive specific and thorough training in handling extremely hazardous, infectious agents and infected animals. All wastes from the animal room, are transported in leak-proof, covered containers for appropriate disposal consistent with applicable institutional, local, and state requirements. An effective integrated pest management program is required. Biological materials that are to remain in a viable state during removal from the animal facility are placed in a durable leak-proof sealed primary container and then enclosed in a non-breakable, sealed secondary container prior to removal from the facility by authorized personnel. These materials are transferred through a disinfectant dunk tank, fumigation chamber, or decontamination shower. Daily inspections of essential containment and life support systems are completed and documented before laboratory work is initiated to ensure that the animal rooms and animal facilities are operating according to established parameters.	Inner gloves worn inside the animal facility are not worn outside the animal facility. -Cabinet Facility: All handling of agents, infected animals, and housing of infected animals is performed in Class III BSCs. - Suit Facility: Personnel wear a positive-pressure suit. The animal room maintains negative pressure relative to the surrounding areas and have HEPA-filtered supply and exhaust systems. A site-specific risk assessment that considers the agent, the potential for agent shedding, and aerosol generation from infected animals is conducted to determine appropriate animal housing. Most infected animals are housed in a primary containment system and handled under a primary barrier system such as a Class II BSC or another containment system.	A separate building or a clearly demarcated and isolated zone. Facility access is restricted, doors are lockable, double-door, pass-through autoclave, personal shower, need of an automatically activated emergency power, monitoring and control systems for air supply, exhaust, life support, alarms, entry and exit controls, and security systems are on an uninterrupted power supply (UPS). -Cabinet Facility: A dedicated, non-recirculating ventilation system is provided. Cages are decontaminated prior to removal from the cabinet. -Suit Facility: A chemical shower is provided to decontaminate the surface of the positive-pressure suit before the worker leaves the facility. Hands-free sinks inside the animal facility. Appropriate communication systems. Supply air to the animal facility, including the decontamination shower, passes through a HEPA filter. All exhaust air from the suit facility, decontamination shower, and fumigation or decontamination chambers passes through two HEPA filters, in series, before discharge to the outside.

BSL4	<i>Biosafety Level 4</i>	Dangerous and exotic agents that pose a high individual risk of aerosol-transmitted laboratory infections and life-threatening diseases that are frequently fatal, for which there are no vaccines or treatments; and related agents with unknown risk of transmission.	Marburg virus and Congo-Crimean hemorrhagic fever virus are examples of biological agents that meet these criteria. Agents with a close or identical antigenic relationship to agents requiring BSL4 containment must be handled at this level until sufficient data are obtained either to confirm continued work at this level or to re-designate the level. The primary routes of exposure to personnel working with these types of biological agents relate to accidental exposure via the percutaneous and mucous membrane routes and inhalation of potentially infectious aerosols.	Clothing change before entry; daily inspections of essential containment and life support systems; all wastes decontaminated prior to removal from the lab; shower on exit.	The laboratory worker's complete isolation from aerosolized infectious materials is accomplished primarily by working in a Class III biosafety cabinet or in a Class II biosafety cabinet with a full-body, air-supplied positive-pressure personnel suit. Use of solid front gowns, scrubs, or coveralls; gloves; full-body, air-supplied, positive-pressure suit.	BSL4 facility itself is often a separate building or a completely isolated zone with specialized ventilation requirements and waste management systems, for both solid and liquid waste, to prevent the release of hazardous biological agents into the surrounding community and the environment. Entry sequence through airlock with airtight doors; walls, floors, and ceilings form sealed with internal shell; dedicated, non-recirculating ventilation system required; double-door, pass-through autoclave required.
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Additional notes:

(1) USDA's APHIS Veterinary Services, other regulatory entities, or local policies and procedures may have additional requirements for working with agricultural pathogens or with animals maintained inside primary containment isolators.

(2) Resource from the Meeting Critical Laboratory Needs for Animal Agriculture: Examination of Three Options (2012); National Academies.