
Animal Biosafety

*Laboratory Biosecurity and Biosafety
for BSL3 Laboratories
Bogor, Indonesia
21 June 2006*

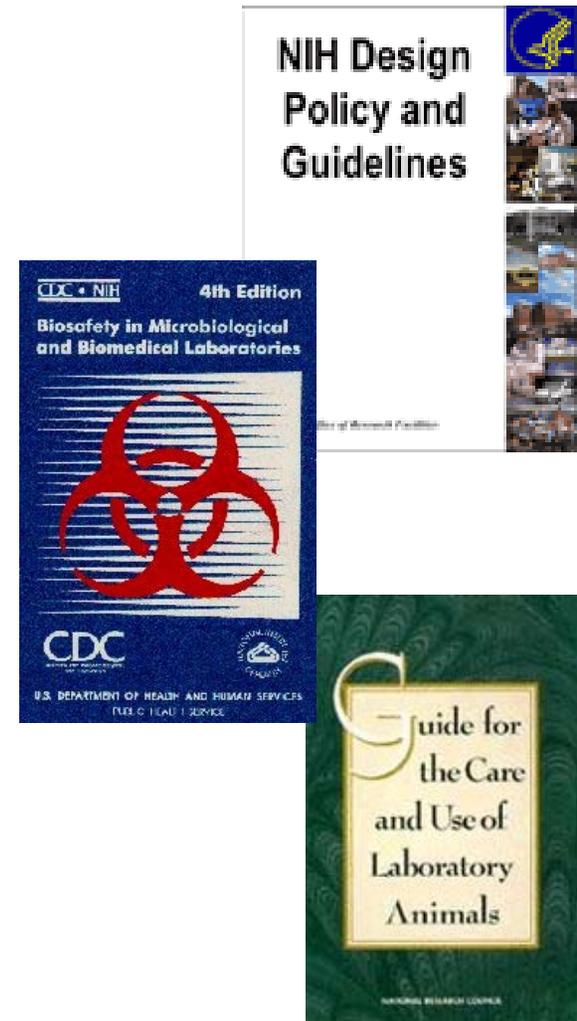
www.biosecurity.sandia.gov

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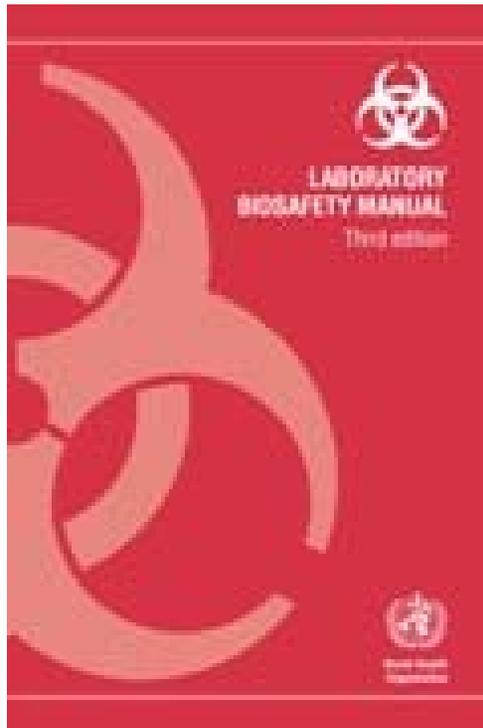
U.S. Guidelines

- **BMBL, 4th ed.**
- **NIH Design Policy and Guidelines**
- **Guide for the Care and Use of laboratory Animals**
- **Animal Welfare Act**
- **Other Publications**



See CD for these publications

International Guidelines



WHO Laboratory Biosafety Manual 2004

3rd edition at:

www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf

See CD for manual

Risk Assessment

- **Prior to construction perform risk assessment**
- **Risk = Likelihood of harm arising from use of biological agents**
 - **Potential for staff exposure to agent/zoonoses**
 - **Cross contamination potential**
 - **Experiment type and number**
 - **Animal species and number**
- **Information from assessment is utilized to determine facility features necessary to minimize risk associated with activities:**
 - **Shower in/out**
 - **Effluent decontamination**
 - **HEPA filtration**
 - **SOPs**

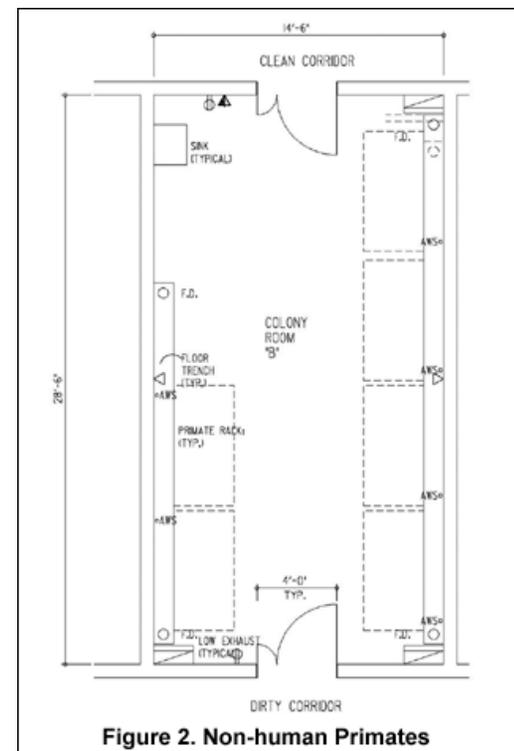
Construction and Design Considerations

- **Materials**
 - Sturdy, nonporous
 - Easy to clean/decontaminate
- **Ventilation and air handling**
- **Waste management system**
- **Fire Protection**
- **Communication system**
- **Laundry facility/ receiving**
- **Animal housing, procedures and disposal**
 - Necropsy
 - Incineration
- **Security**
 - Animal protection
 - Staff
 - Equipment
 - Data
 - Facility

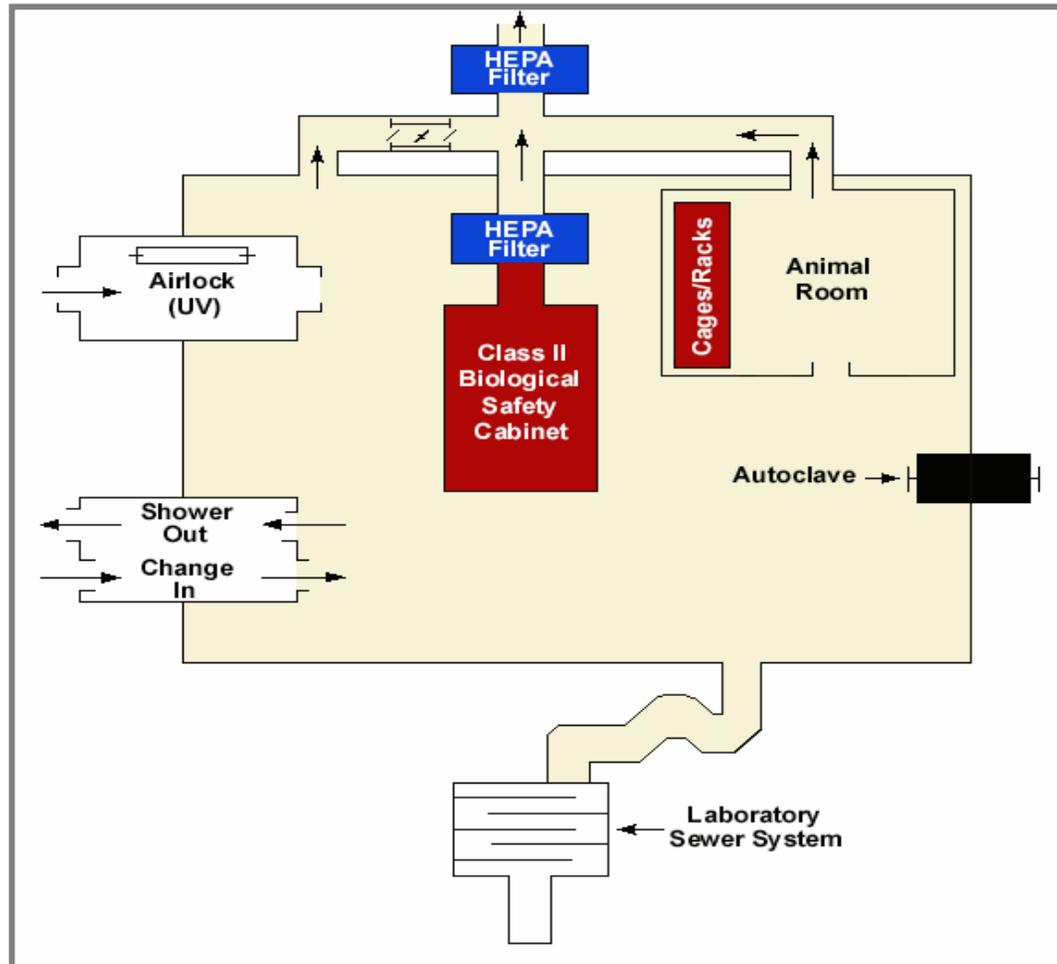


Other Facility Considerations

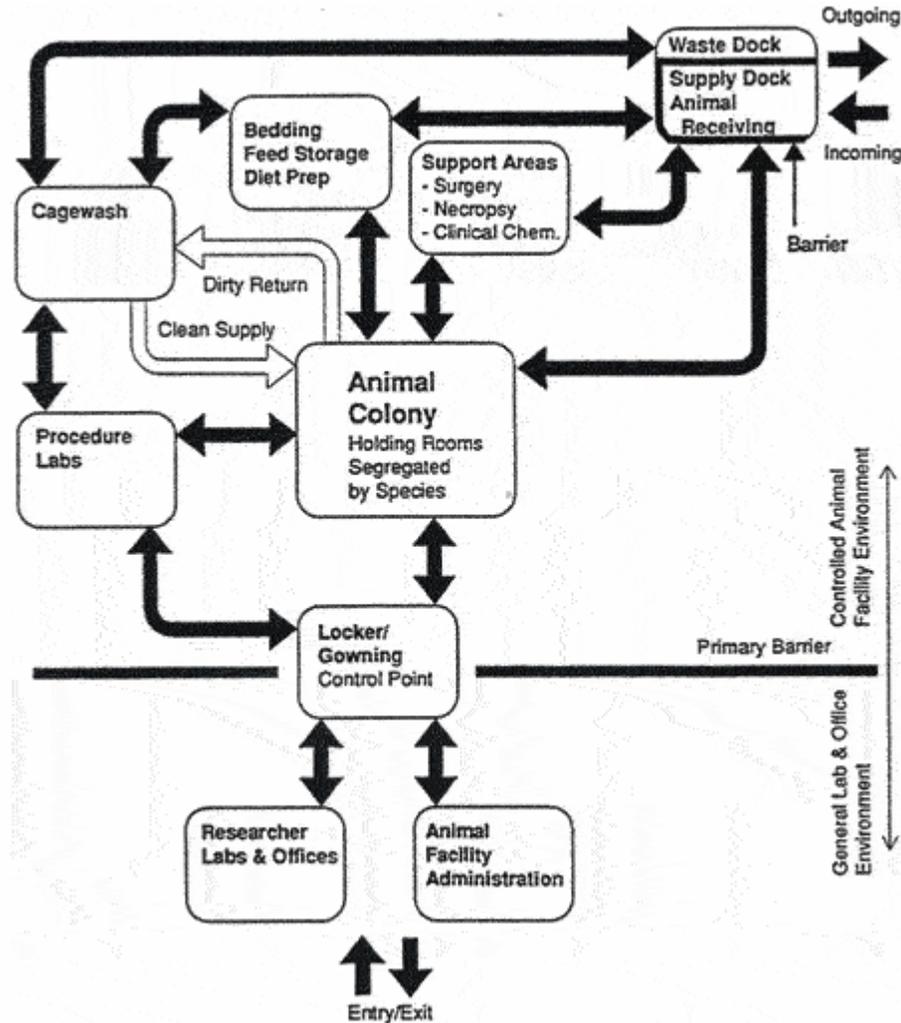
- House animals away from public parts of laboratory
- Lighting, temperature and humidity controls
- Visualization without disturbance
- Housing for different species or animal size
- Housing for different biological agents
- Decontamination (facility and effluent)
- Cage decontamination and washing
- Animal delivery/receipt and quarantine
- Animal movement within facility
- Infestation program



Animal Room in BSL-3 Lab

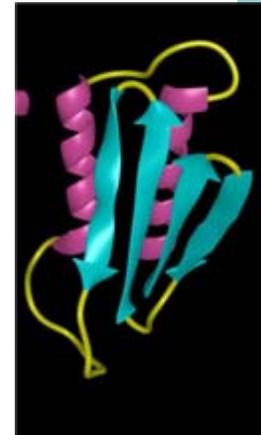
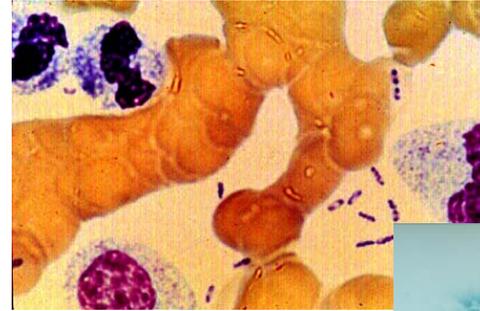


ABSL-3 Floor Plan



Biological Agent Considerations

- **Agent characteristics**
 - Transmissibility
 - Infectivity
 - Stability
- **Modes of transmission**
 - Aerosol
 - Vector-borne
- **Concentration of biological agent used for experiments**
- **Excretion routes**



Animal Considerations

- **Safety**
 - **Animal**
 - **Personnel**
- **Species**
- **Size and number**
- **Aggressiveness**
- **Natural parasites**
- **Zoonotic disease**
 - **Some zoonoses don't cause symptoms in animals**
- **Potential blood and body fluid exposure**
- **Animal identification protocols**
- **Animal health, well-being**



See CD for Animal Care and Use Guidelines

Animal Care and Use

- **Animal Care**
 - **Care providers should be properly trained**
 - **Care providers are important in the experimental process**
 - **Prevention of cross contamination**
 - **Animal health**
 - **Animal comfort**
- **Animal Experiment Considerations**
 - **Start with smaller, less expensive animals in early experimental stages**
 - **Use larger animals only when experiments with smaller animals succeed and there is a need to use other species**
 - **Use only as many animals as absolutely necessary**
 - **Consider animal comfort**
 - **Use only ethical, humane and approved methods for experimentation, anesthesia, euthanasia**

Animal Record Keeping

- **Date of receipt**
- **Source**
- **Species and gender**
- **Animal identification (ear tags, tattoos)**
- **Pertinent characteristics**
- **Experimental protocols**
- **Biological agents utilized**
- **Medical and diagnostic procedures**
- **Final disposition**



Housing Considerations

- **Dependent on size and species**
- **Types**
 - **Cages**
 - **Group housing**
 - **Runs**
- **House animals away from**
 - **Sharps**
 - **Equipment**
 - **Animals in other vessels**
- **Housing should prevent escape**
- **Aerosolization likely**
 - **Animal activity**
 - **Cleaning**



Animal Biosafety Levels

- If experimental animals are used, institutional management must provide facilities and staff established practices that reasonably ensure appropriate levels of environmental quality, safety, and care
- Four biosafety levels differentiated for animal experiments (ABSL 1- 4)



ABSL 1

- **This level is suited for work involving well-characterized agents that are not known to cause diseases in healthy adult humans, and the are of minimal potential hazard to laboratory personnel and the environment**
- **Standard microbiological practices are employed**
- **Basic primary and secondary barriers are used**

ABSL 2

- **This level involves practices for work with those agents associated with human disease**
- **It addresses hazards from ingestion as well as from percutaneous and mucous membrane exposure**



ABSL 2

- **Access to animal rooms is limited to the fewest number of individuals possible**
- **Appropriate medical surveillance program is in place**
- **All procedures are carefully performed to minimize the creation of aerosols**
- **Animal care laboratory and support personnel receive appropriate training on any potential hazards**

ABSL 3

- **This level involves practices suitable for work with animals infected with indigenous or exotic agents that present the potential of aerosol transmission and of causing serious or potentially lethal disease**
- **All requirements for ABSL 2 must be met, in addition to the specific requirements for ABSL 3**

ABSL 3

- **Cages are autoclaved and thoroughly decontaminated before bedding is removed and before they are cleaned and washed.**
- **All waste from the animal room must be autoclaved prior to incineration or other appropriate terminal treatment.**
- **Materials not related to the experiment are not permitted in the animal room.**



BSL 3 Ag Considerations

- **Large Animal Species**
- **No Primary Containment Equipment**
- **Facility is the Primary Barrier**
- **Environmental Protection**
- **Resistant, Skid-proof Surfaces**
- **Animal receipt; movement in facility**
- **Special restraint equipment (squeeze chute)**
- **Decontamination/sterilization of waste and effluent**
- **HEPA Filter treatment of exhaust and supply air, and also plumbing vents**
- **Provision for personnel changing rooms and “Shower Out” capability**
- **Some restriction on contact with domestic animals**



ABSL 4

- **This level involves practices suitable for addressing dangerous or exotic agents that pose a high risk of life threatening disease, aerosol transmission, or related agents with unknown risk of transmission**
- **Must have maximum containment equipment, such as a Class III BSC or partial containment equipment in combination with full-body, air-supplied, positive pressure suit, used for all procedures and activities**

Animal Equipment

- Small animal cages



Animal BSL-2

- Containment caging should be used as appropriate for the species
- Cages must only be opened in biosafety cabinets

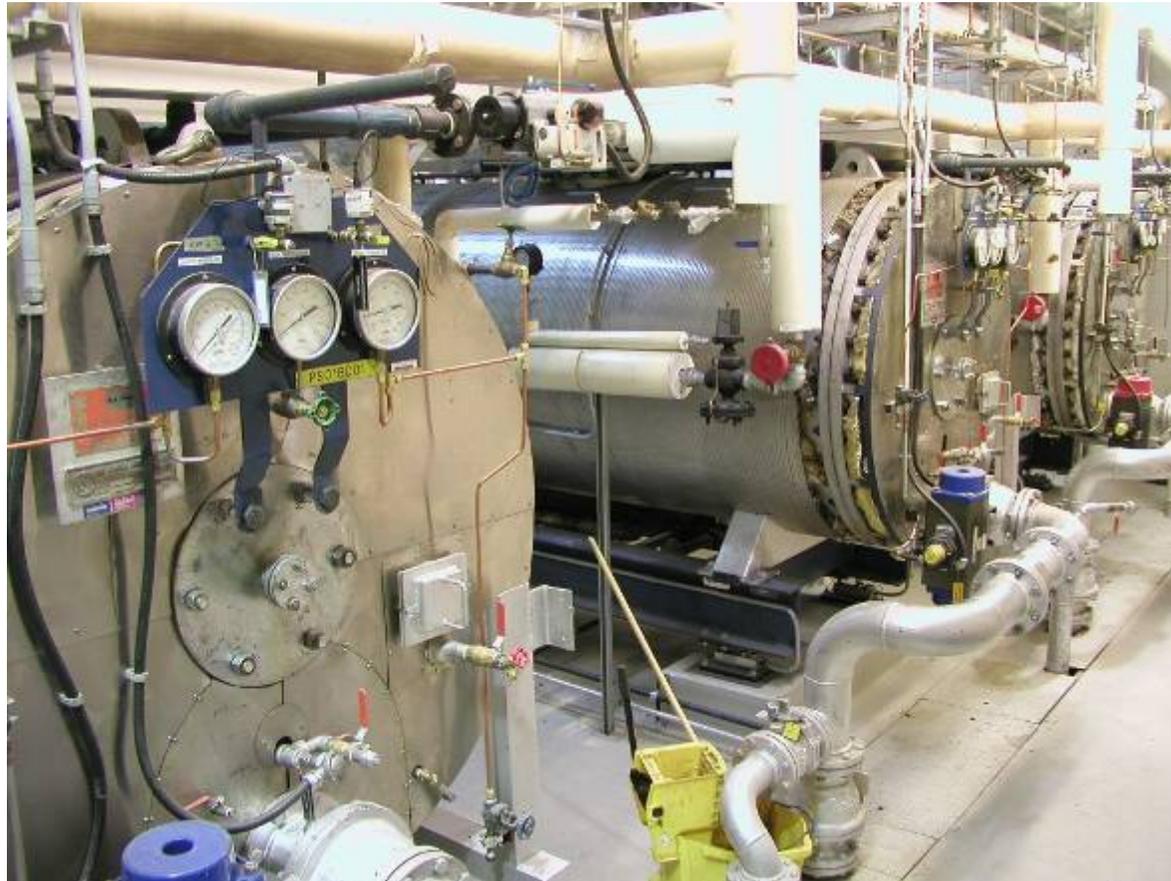


ABSL-3

- Physical separation from access corridors
- Animals in containment cages
- Cubicles sometimes used for segregating caging units



Wastewater Treatment



CSCHAH



Animal Facility Containment: Summary of Practices and Safety Equipment

Risk Group	Animal Containment Level	Lab Practices and Safety Equipment
1	ABSL-1	Limited access: Protective clothing, Gloves
2	ABSL-2	ABSL-1 requirements. Hazard signs; Class I or II BSC; Decontamination of waste and cages before washing
3	ABSL-3	ABSL-2 requirements. Controlled access; BSC; Special protective clothing for all activities
4	ABSL-4	ABSL-3 requirements. Strictly limited access; Clothing change prior to entry; Class III BSC or positive pressure suits; Shower on exit; Decontamination of all wastes prior to removal from facility

WHO Lab Biosafety Manual, 3rd edition

See CD

Common Engineering Features of Animal Biosafety Levels

Examples

	Directional Airflow	Double Door Entry	Autoclave Available	Pass-through Autoclave	Seamless Floors*	Monolithic Ceilings *	HEPA Filtered Exhaust	HEPA Filtered Supply	Supply/exhaust interlock	Personnel Shower	Airlock Entry	Pressure Differential	Restricted Access	Effluent Decontamination	Incinerator	Breathing Air System				
BSL-3 Animal Facility	●		●	●	●	●	●		●	●			●							
BSL-3 AG Lab & Animal	●	●		●	●	●	●	●	●	●	●	●	●	●	●					
BSL-4 Lab & Animal	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●				

* Construction for easy cleaning and decontamination

