

DEFINING ANIMAL BIOSAFETY LEVEL 3 AND BSL3 AG

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ABSL-3

- ▣ 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 [in humans] (BMBL 5)
- ▣ Facility, safety equipment, and practices applicable to clinical, diagnostic, research, or production facilities in which work is done with indigenous, or exotic agents with a potential for transmission, and which may cause serious and potentially lethal infections, or grave economic consequences if released (*Applied Biosafety* Vol. 12, No. 3, 2007)

ABSL-3 / BSL3 Ag

- ▣ Primary hazards/risk:
 - Exposure to infectious materials to humans and animals in the vivarium
 - Escape of the agent to the environment
- ▣ Emphasis on primary & secondary barriers *to protect*:
 - Vivarium staff & animals in contiguous areas
 - The community of humans and animals
 - The environment

ABSL 3 Containment Levels

- ▣ ABSL 3 – for work with livestock pathogens of low consequence - described in BMBL 5
- ▣ ABSL 3 enhanced - for work with livestock pathogens of high consequence in a primary containment device – described in Appendix D, Part III of BMBL 5 and ARS 242.1
- ▣ BSL3 Ag – for work with livestock pathogens of high consequence where the room is the primary containment – described in Appendix D, Part II and of BMBL 5 and ARS 242.1

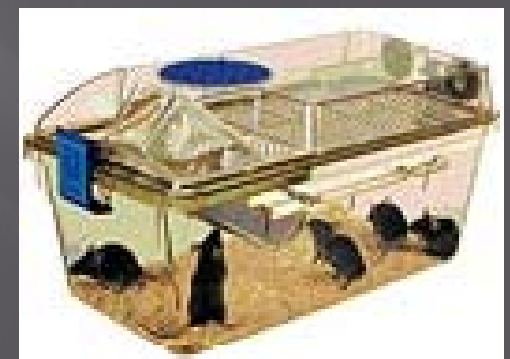
High Consequence Livestock Agents

- ❑ African swine fever virus
- ❑ Avian influenza virus (highly pathogenic)
- ❑ Classical swine fever
- ❑ Foot and mouth disease virus
- ❑ Lumpy skin disease virus
- ❑ Contagious bovine pleuropneumonia
- ❑ Contagious caprine pleuropneumonia
- ❑ Newcastle disease virus
- ❑ Peste des petits ruminants
- ❑ Rift Valley fever virus
- ❑ Rinderpest virus

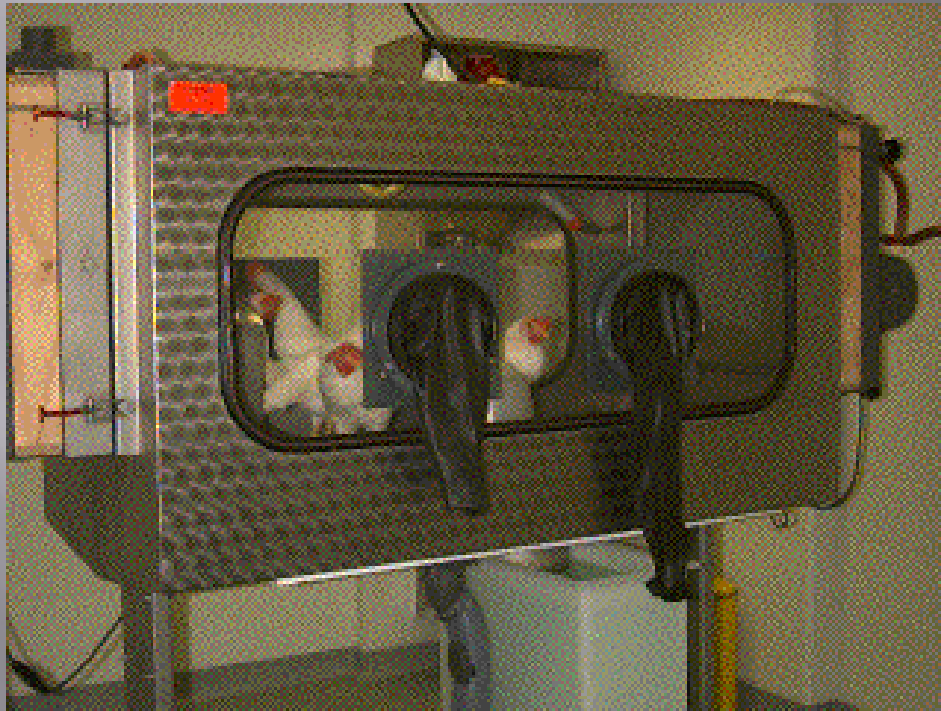
ABSL 3 and ABSL 3e Primary Barriers and PPE

▣ Animal Caging

- Increase infectious pathogen containment with (partial or full) *containment caging systems* as per risk assessment.
 - ▣ Eg: Rodent-filtered top caging, inward flow ventilated enclosures, HEPA-filtered primary barrier systems appropriate to species
- When primary containment caging can not be used the animals are then considered “loose-housed” and personnel must use additional PPE and increased secondary containment.



Poultry Isolator



Ventilated Caging Systems



Respiratory Protection



Primary Barriers and PPE

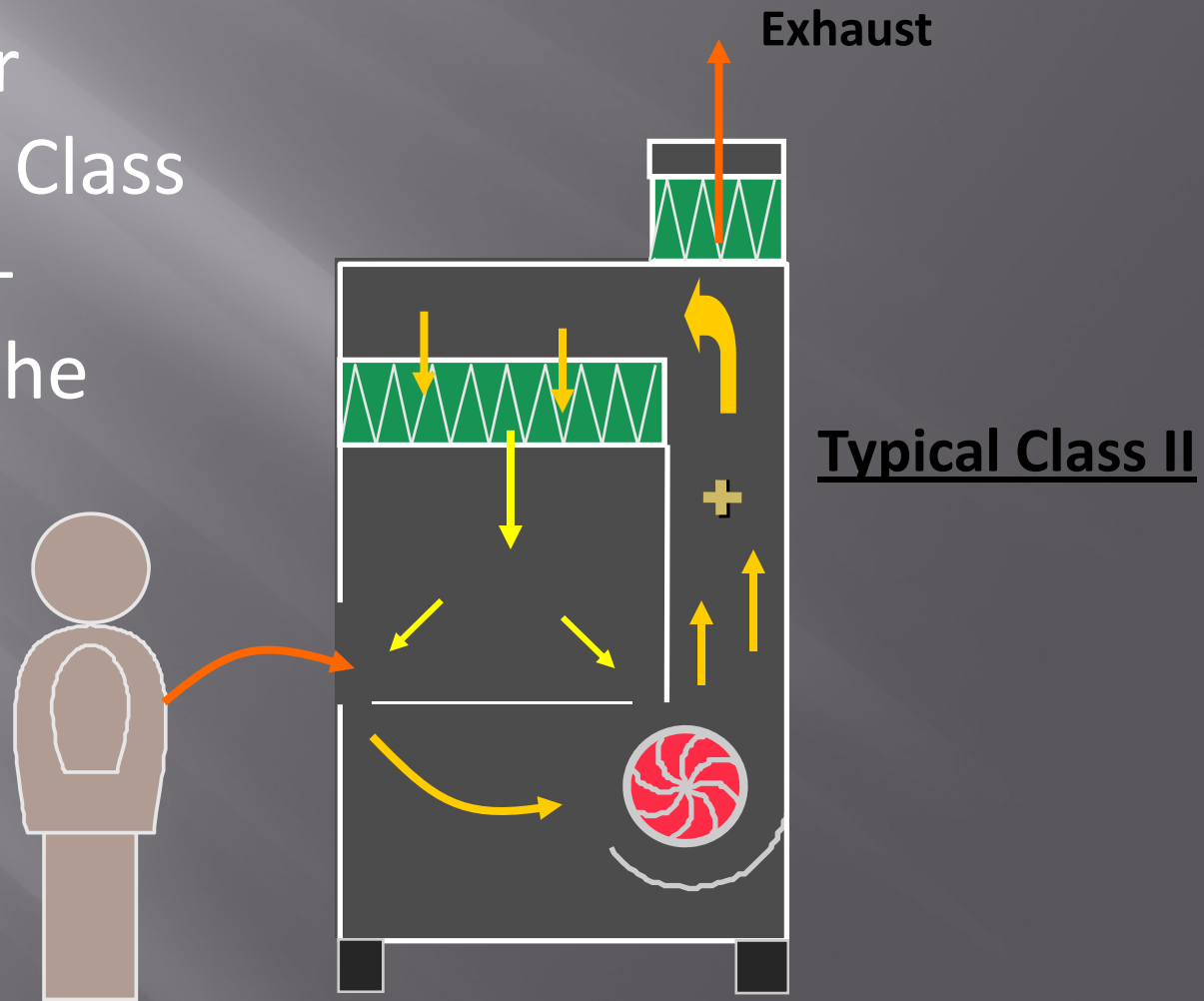
- ▣ All ABSL-3 work should be done in a primary barrier
- ▣ All procedures (agent, animal, sampling, necropsy, etc) with biohazard must be conducted in a primary containment device when practical
 - Eg: Harvesting of tissues / fluids from infected animals or eggs, intranasal inoculations, etc.



Vivarium Facilities

Primary Barriers

HEPA filtered air from a certified Class II BSC can be re-circulated into the lab



Animal in BSC





Vivarium Facilities

Secondary Barriers

- ▣ Doors must be self-closing and lockable.
- ▣ Must be separated from general traffic flow.
- ▣ Access restricted by two self-closing doors.
- ▣ Clothing change room (anteroom) may be between these two doors.
 - *ABSL3 Shower optional (based upon RA)*
 - *BSL3e Shower mandatory out of the animal rooms*
 - *BSL3 Ag Shower mandatory out of the animal rooms and main building*

Double door Entry

Corridor

Anteroom

Animal Room

FIRST AID SUPPLIES
SAFETY SUPPLIES



Entry/Exit



Change room



Vivarium Facilities

Secondary Barriers

- ▣ Animal rooms must have a sink for hand washing
 - That is hands-free or automatically operated
 - That is located near the exit door
 - When vivarium is segregated into different zones, a sink must be available for hand washing in each zone.
 - Body shower may double as a sink out of BSL3 Ag



Vivarium Facility Construction

Secondary Barriers

- ▣ Facility must be easily cleanable.
 - No rugs or carpets
 - Seams, floors, walls and ceiling surfaces must be sealed
 - All penetrations sealed
 - Doors and air vents must be capable of being sealed for decontamination
 - ▣ BSL3 Ag has bubble-tight dampers

Vivarium Facility Ventilation Secondary Barriers

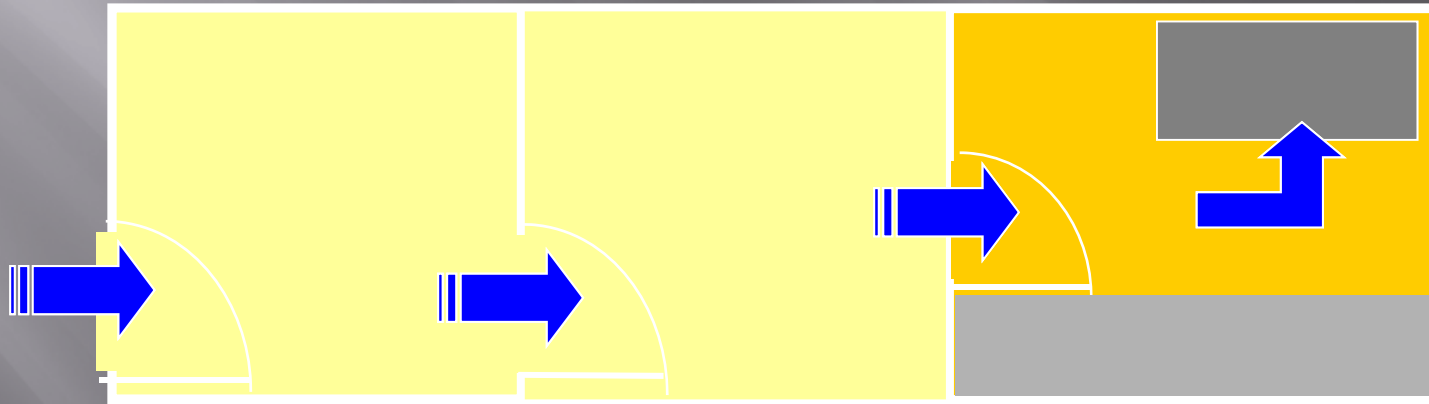
- ▣ A ducted ventilation system is required that:
 - Will not reverse airflow in failure conditions
 - Disperses building exhaust away from building supply air intake
 - Provides for a visual monitoring device which confirms directional airflow at lab entrance



Vivarium Facility Ventilation

Secondary Barriers

- Ducted system provides sustained directional air flow from “clean” to “potentially contaminated” areas
- Series of negative pressure gradients



Vivarium Room Integrity

- ▣ ABSL3
 - Room is leaky but capable of being sealed
- ▣ ABSL 3 enhanced
 - Room is tight
 - ▣ Tested for integrity by soap bubble test
 - Has controlled make up air supply (e.g. around or through doors)
- ▣ BSL3 Ag
 - Room is air tight
 - ▣ Tested by pressure decay test
 - ▣ No leaks around doors

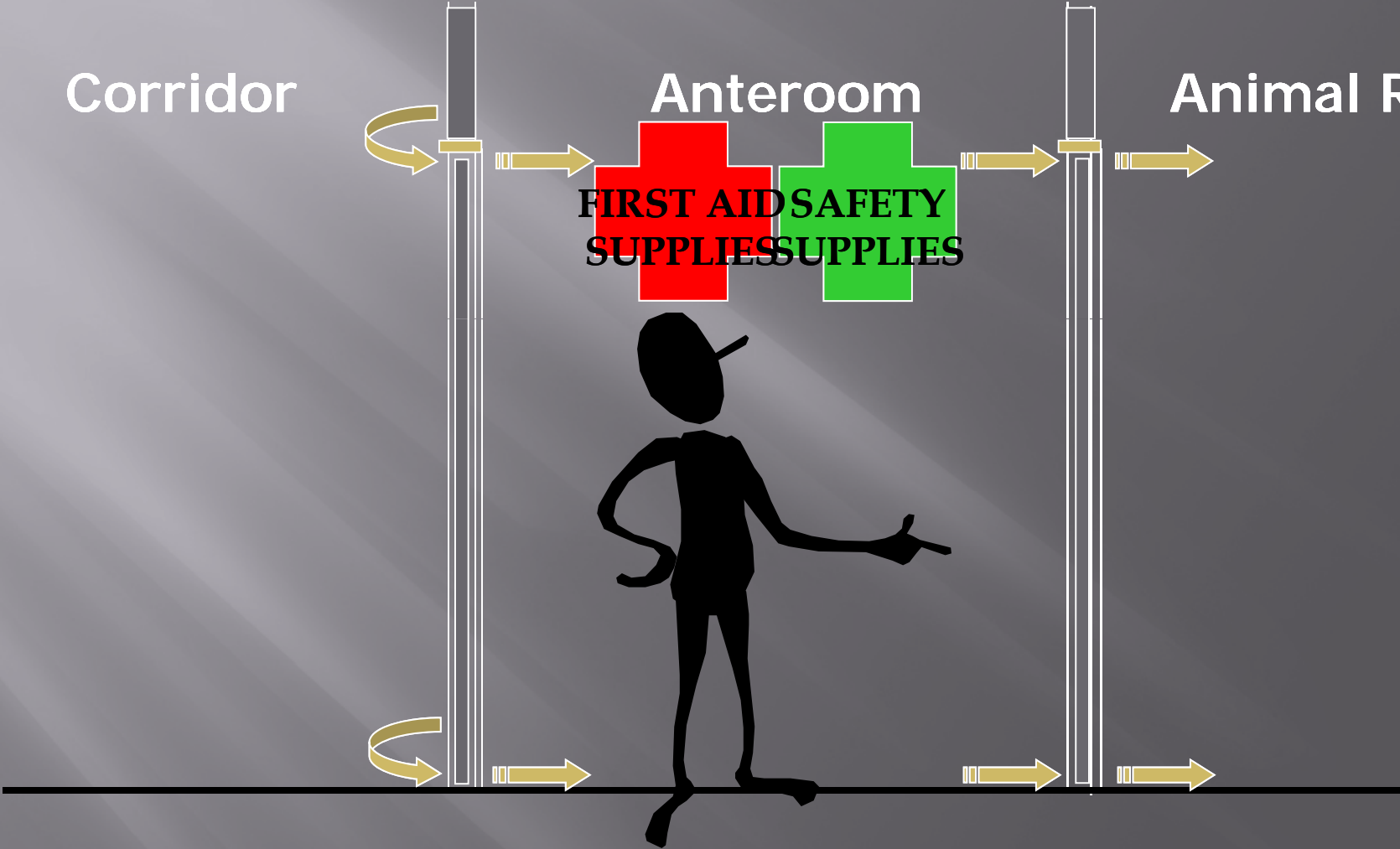
Supply Air Movement

Corridor

Anteroom

Animal Room

FIRST AID SUPPLIES
SAFETY SUPPLIES



Air Pressure Resistant (APR) Doors



Air Inflatable Gasket
APR door



Compressed Gasket
APR door

Vivarium Air Handling

- ▣ ABSL 3
 - HEPA exhaust filter is optional based on RA
- ▣ ABSL 3 enhanced
 - HEPA exhaust filter is mandatory and duct work pressure decay tested
- ▣ BSL3 Ag
 - HEPA exhaust filter mandatory, duct work pressure decay tested, with fan interlocks and bubble-tight dampers or HEPA filters on the supply
 - HEPA filters in series and parallel on exhaust and parallel on supply

Vivarium Liquid Waste Handling

- ▣ ABSL 3
 - Floor drains maintained and filled with disinfectant, treatment dependent upon RA
- ▣ ABSL 3 enhanced
 - Liquid effluent must be captured and treated
 - Floor drains are discouraged
- ▣ BSL3 Ag
 - As above, but to a validated EDS that can handle large amounts of liquids and some solids
 - Contained piping (single or double walled)

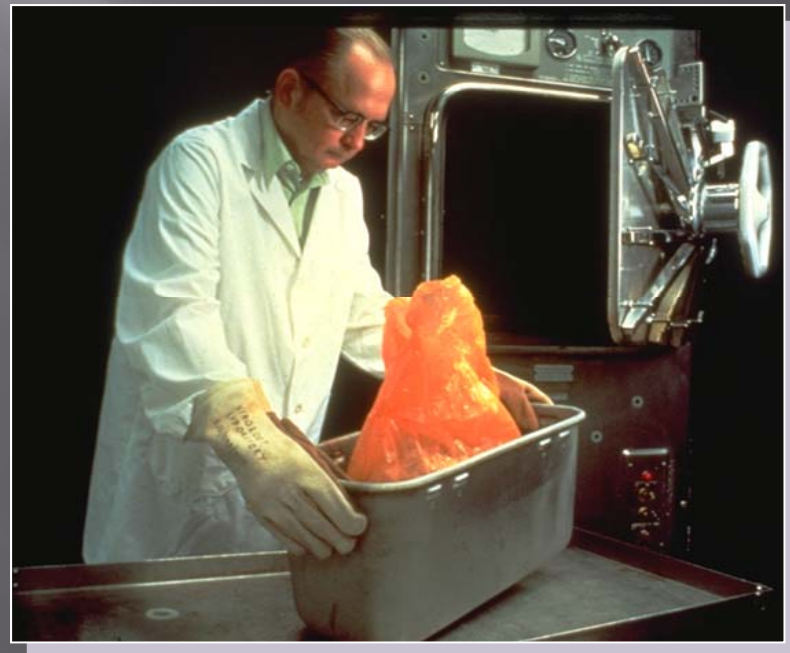


Liquid Waste Cooker



Vivarium Solid Waste Handling Secondary Barriers

Autoclaves or other validated method for decontamination should be available that is convenient to the animal room.

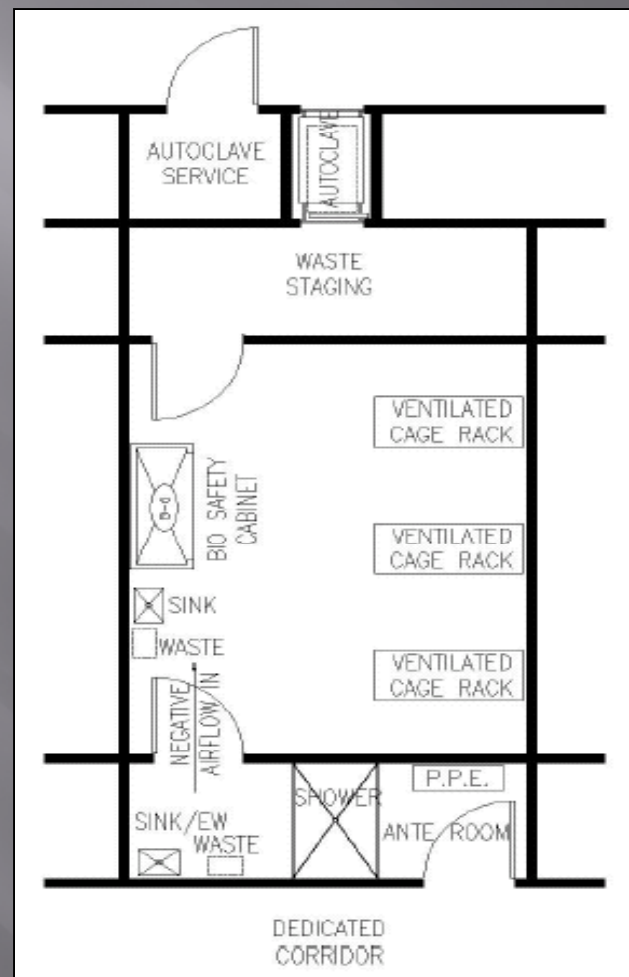


Animal Use & Disposal

- ❑ Large animal rooms with configurable penning
- ❑ Necropsy rooms equipped to accommodate large farm animals.
- ❑ Safe disposal of the large carcasses by pathological incinerators, or other approved tissue disposal methods

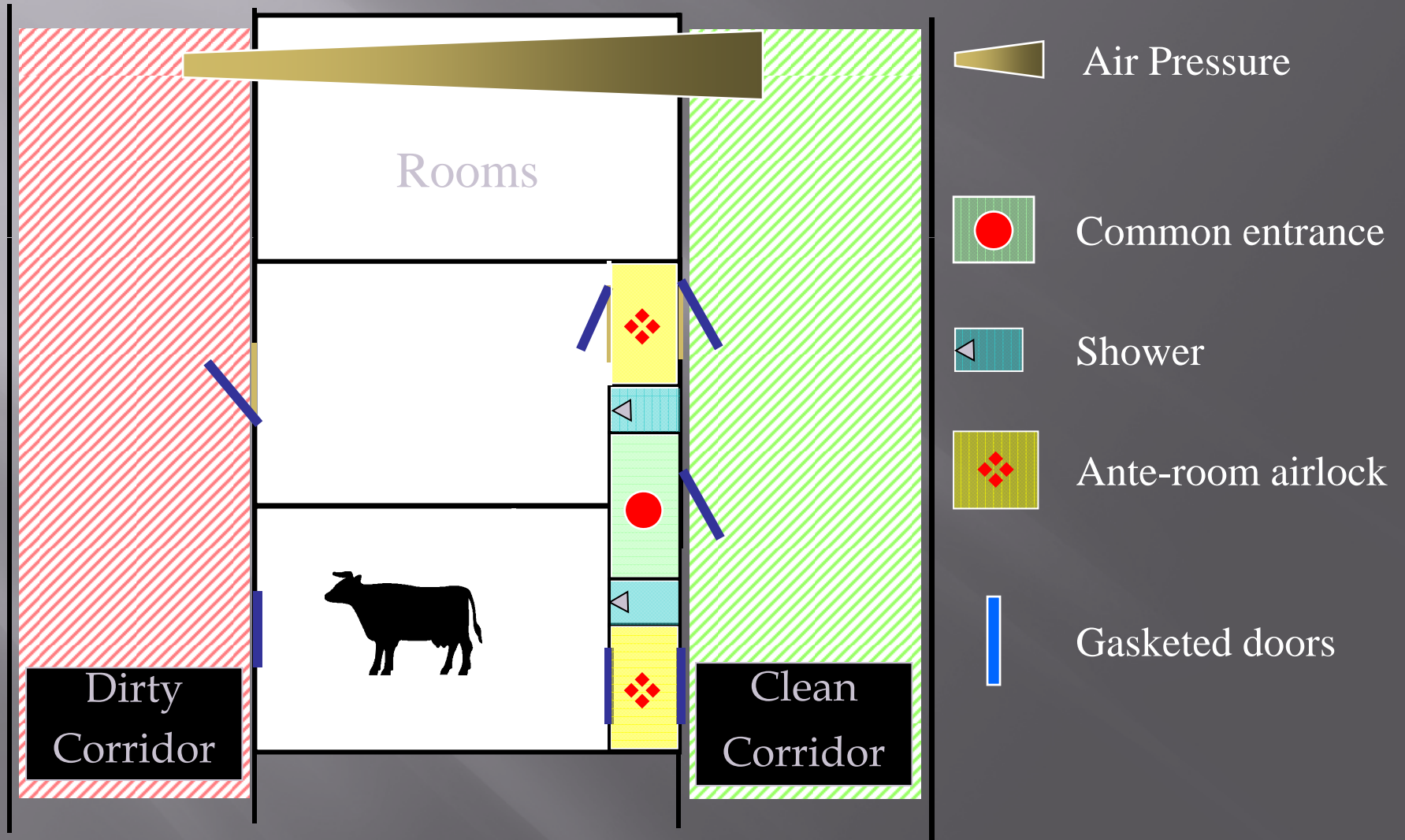


ABSL 3 Facility





BSL3 Ag Room Layout



ABSL 3e versus BSL3 Ag

- ▣ When do I need one vs. the other?
 - BSL3 Ag is needed ONLY when working with 11 select agents and the room is the primary containment
- ▣ So how is BSL3 Ag different than ABSL3 enhanced?
 - Pressure decay testing of the animal room walls (completely sealed animal room)
 - Extra HEPA filtration of the exhaust
 - Extra shower upon main building exit

Summary

- Work with high consequence Ag agents in the laboratory does NOT require BSL3-Ag containment
- Work with loose-housed animals with some (11) Ag agents where the room become the primary containment requires BSL3-Ag
- An onsite risk assessment is vital to determining the level of containment required to work with Agriculture agents of concern.

THANK YOU AND
ACKNOWLEDGEMENT TO ALL
BIOSAFETY COLLEAGUES THAT
PROVIDED SLIDES

