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# Layer by Layer: A Look at BRI Safety

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# LAYER by LAYER

## A LOOK AT BRI SAFETY

Biosecurity Research Institute biosafety officer Julie Johnson likes to think of BRI safety as an onion: it has layers of precautions that keep the facility safe and secure. From lab construction and staff training to safety procedures, these layers of safety exist to protect staff, the public and the environment.

The BRI at Pat Roberts Hall is a biocontainment research facility that has enhanced biosafety level 3 (BSL-3) and biosafety level 3 agriculture (BSL-3Ag) labs. The labs are designed for work with pathogens — disease-causing microorganisms — that are transmitted by airborne means.

"There's often the misperception that pathogens are floating in the air in BSL-3 labs, and if you inhale you'll get sick," said Johnson, also K-State assistant vice president for research compliance. "It's not that way. We take many different precautions just in case multiple things go wrong."

The 31,000 square feet of lab, animal holding and support space allows scientists to research diseases such as wheat blast, highly pathogenic avian influenza, brucellosis, plague, tularemia or exotic bluetongue virus. Researching these types of pathogens is important for food safety and public health, Johnson said, but extra precautions are necessary to ensure safety.

The first basic layer of BRI safety starts with the construction of the building itself, which contains biocontainment and security features, Johnson said. Security includes a fence, secure entrances and security cameras.

Containment, the area inside the building where labs are located, is separated from the rest of the hallways and offices. Change rooms with interlocked doors mark the containment area entrance. Labs inside containment are isolated from each other and separated by an additional hallway that serves as a buffer zone in case any contamination occurs inside the labs. All labs are designed for maximum cleanability. Gas and liquid disinfectants are used for cleaning.

"An electronic building management system monitors air pressure differences between rooms and tweaks the ventilation systems to ensure constant proper airflow," Johnson said.

That means air moves from clean areas toward more potentially contaminated containment areas and never recirculates to other parts of the building. HEPA filters clean both the exhaust air and the supply air so it is clean for research.

The building's extensive back-up systems provide a precautionary layer of protection. A generator keeps critical systems running if power is lost. Duplicate exhaust fans and waste treatment tanks allow normal operation even during maintenance.

Well-trained staff who thoroughly understand biocontainment practices create another layer of safety, Johnson said. Staff members — including research, lab support and animal care staff — must take a 30-hour safety training course every year that includes hands-on practice in a simulated lab and participation in emergency drills.


After completing training, a layer of safety procedures protects staff when they work in containment.

Researchers must completely change out of street clothes and put on a fresh set of lab clothes before entering the containment area. When they reach their lab, they add another layer of protection: a lab coat, gloves and safety glasses. Depending on the activities they will conduct, they may also wear a respirator, shoe covers or even a second layer of clothing.

Researchers reverse this process when exiting the labs, shedding layers of protective equipment and leaving them in the more contaminated rooms they are exiting. They may also be required to shower before coming out of the containment area to protect any materials from entering the rest of the building.

All pathogen manipulations in labs are performed in biosafety cabinets, which are safety enclosures that use HEPA filters and directional airflow to contain pathogens in the cabinet.

"Learning to use biosafety cabinets is an important part of training," Johnson said. "People are taught to work slowly and methodically so they don't disrupt the air currents."

Pathogens are sealed in two layers of containers before transfer back to freezers to prevent any spills. All waste is autoclaved before leaving containment. An autoclave is a pressure cooker that kills pathogens using steam heat. Any liquid going down drains is treated in large cook tanks that also use steam heat.

"Nothing comes out of the labs that isn't disinfected in some way," Johnson said. "When we say nothing leaves containment without being decontaminated, that means nothing: air, liquid, waste, equipment and people."

The five BSL-3Ag rooms are for large animals that are loose-housed, so the room, instead of a biosafety cabinet, is the primary containment space. Such rooms have extra safety measures, including airtight doors, double HEPA-filtered exhaust and extra sealing of walls, floors and ceilings. Researchers must wear an extra level of protective gear and always shower before exiting these rooms.

Another layer of safety involves medical surveillance and emergency incident response plans. Scientists must have medical exams and receive necessary vaccinations before performing research. They're also taught to look for any medical symptoms related to pathogens they use in the BRI.

BRI staff communicates with Mercy Regional Health Center staff at least monthly to ensure hospital staff are aware of all pathogens being used in the BRI. The Mercy Occupational Health Services department develops specific surveillance, prevention and treatment plans. BRI staff also perform drills with local emergency response teams so everyone is prepared in the unlikely event of an accident.

All of these layers of protection help make the BRI a safe and secure location where scientists can conduct much needed research on pathogens. The research helps develop protective vaccines, diagnostic tests and treatments to prevent future outbreaks, protecting agriculture and public health.

*By Jennifer Torline, Communications and Marketing*