

### Ask the Experts

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Do you have a biosafety question and you're not sure who to ask? Send your questions to the "Ask the Experts" column and I'll get them answered for you. Drawing from my own experience or that of other experts in the field, we'll try to compile a thorough and comprehensive answer to your question. Please e-mail your questions to [jkeene@globalbiohazardtechnologies.com](mailto:jkeene@globalbiohazardtechnologies.com) or Co-Editor Barbara Johnson at [barbara\\_johnson@verizon.net](mailto:barbara_johnson@verizon.net) or Co-Editor Karen B. Byers at [karen\\_byers@dfci.harvard.edu](mailto:karen_byers@dfci.harvard.edu).

#### Pre-filters—When and Where to Use Them

##### Question

We have built an ABSL-3 facility and are concerned about the potential loading of HEPA filters with animal hair and dander. What is the best way to handle this potential problem?

##### Answer

It is true that animal hair and dander will certainly reduce the life expectancy of any filter system; the HEPA filter would be particularly sensitive to this type of loading. Considerable time and expense can be avoided by installing pre-filters in the system. However, please remember that in an animal containment facility where the animals may be infected with zoonotic agents and human pathogens, the animals could be shedding the infectious agents in any number of ways. Respiratory pathogens might be shed from the animals via respiratory secretions, while other agents might be shed in the animals' urine or feces. In either case, the released pathogens can contaminate the body of an animal (hair, skin, etc.) and be released into the air by the natural movements and interactions of those animals. In addition, the agents excreted in urine and feces can become airborne as these materials dry and subsequently be released during animal handling, feeding, or the changing of bedding.

There are two places to include pre-filters in ABS facilities:

1. The filters can be placed in the animal holding room at the exhaust duct.
2. The filters can be placed in the HEPA filter housing in the mechanical room.

Generally, the best place to put the pre-filter is at the exhaust register in the containment room. If the filters

are in the room, personnel can observe their condition and change them on a regular basis. With the filters in the room, the animal care personnel can, with appropriate personal protective equipment and procedures, remove the filter, place it in a biohazard bag, and autoclave it out of the facility.

However, in many of the new animal biocontainment laboratories, the trend is to include a pre-filter housing with the HEPA filter housing in the mechanical space. While this may seem necessary because of the potentially infectious nature of the material being caught in the pre-filter, it is actually a very costly situation. Pre-filters need to be changed quite frequently. When they are in the HEPA filter housing, they are contained, but in order to be changed, they must be removed from the housing. Since the housings are located in the mechanical space outside the containment envelope, they must be decontaminated prior to being opened. Decontamination of the housings once a year for routine HEPA filter testing is reasonable, but decontamination of these housings two to three times a month to change the pre-filters is not. Such a requirement would disrupt the workflow in the facility in addition to being cost-prohibitive.

Therefore, pre-filters should be installed in the animal holding rooms, where they can easily be changed on a regular basis, rather than in the HEPA filter housing in the mechanical space.

##### Question

What about pre-filters in non-animal spaces?

##### Answer

Some designers and mechanical engineers are of the opinion that pre-filters will extend the life of the HEPA filters used in biocontainment facilities. Pre-filters are appropriate where significant dust and particulates are generated. In nuclear power plants and perhaps some chemical facilities, the pre-filter in the exhaust housing may be necessary. In these situations, there is no way to decontaminate the filters and they are removed and replaced using appropriate precautions to prevent exposure to personnel and the environment.

The situation is not the same in biocontainment laboratories where infectious agents are involved. Since the laboratory supply air is usually filtered to at least 95% and

no significant dust is generated in these research laboratories, the use of pre-filters in the exhaust is generally not necessary. If pre-filters are placed in the HEPA filter housing, if and when they load, the same decontamination

process that is used for the HEPA filter housing in the animal biosafety facility must be used to change them. Again, the problems and costs associated with changing these filters far outweigh the benefit of providing them.

## Biosafety Tips

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Biosafety Tips brings you practical approaches to biosafety or “news you can use.” If you are looking for a useful and sensible solution to a biocontainment problem or perhaps a reference to help convince a skeptical researcher of the need for caution, this is the place to look. In this column I will share some biosafety insights for managing a variety of workplace situations. I welcome feedback or suggestions for future topics. Please e-mail any comments or suggestions to karen\_byers@dfci.harvard.edu or to Co-Editor Barbara Johnson at barbara\_johnson@verizon.net.

### Is the Community at Risk to Exposure from Microbes in the Lab?

Publications past and present indicate that laboratory biosafety containment practices work well to protect the outside community from exposure to the human pathogens. Lapses in research containment practices are extremely rare, and the accounts are guideposts for biosafety practice. In identified cases, the incidents have been investigated and reported to prevent re-occurrence. This column will review the few community exposures that have occurred, the associated lapses in proper biosafety containment practices, and the lessons we’ve learned from them. The deliberate criminal acts of 2001, in which the mailing of anthrax spores caused 5 deaths and 17 infections, are being excluded because this tragic biosecurity lapse did not originate from authorized laboratory research (Federal Bureau of Investigation). The same exclusion applies to the contamination of restaurant salad bars by a religious commune in Oregon. This resulted in 751 cases of Salmonellosis; an investigation identified the same strain of *S. typhimurium* in a laboratory at the commune (Torok et al., 1997).

### Failure to Limit Research with High-consequence Pathogens to Appropriate Laboratory Facilities

Smallpox was eradicated from the world population in 1977. Unfortunately, in 1978 two more cases oc-

curred in Birmingham, England. The index case was a photographer who became infected by aerosol air leaked into her office from an exhaust duct. The photographer survived; however, the secondary infection of her mother resulted in a fatality. The smallpox laboratory director committed suicide after learning about the two infections (Collins, 1999; Heymann et al., 2004).

### Failure to Decontaminate Vaccine Before Disposal

In 2000, eight children in Vladivostock, Russia became infected while playing with discarded vials of smallpox vaccine. The community initially feared that the children had been exposed to smallpox, since they were not aware that the live virus in smallpox vaccine is *vaccinia* (ProMED-mail, 2000).

### Inadequate Decontamination of Materials Removed from the Laboratory

Six cases of Q fever occurred in commercial laundry staff that cleaned linens and uniforms from a laboratory working with *C. burnetii* (U.S. Department of Public Health and Human Services et al., 1999). It is not clear whether that number also includes the infection of a laundry worker in 1948 and a case in a household contact of a laboratory worker in 1950 (Collins et al., 1999).

In 2004, nine cases of SARS occurred in Beijing, China. The two index cases were identified as graduate students at the University of Virology who worked in a BSL-2 laboratory with samples that were inactivated and then removed from the BSL-3 SARS lab. Unfortunately, the virus inactivation procedures for SAR Co-V were not verified and were later proven to be insufficient. The mother of one student was fatally infected. The nurse who cared for both the infected student and the student’s mother also became infected and transmitted SARS Co-V to five other patients. This is the only reported instance of tertiary transmissions from laboratory-associated infections. A subsequent analysis of stored serum samples identified two previous cases among the BSL-2 laboratory staff; the illnesses were self-limiting cases that were not diagnosed