

## 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).

### Protecting Surfaces in BSL-3 Suites and Animal Facilities—Are Work Surface Pads and Disinfectant or Sticky Floor Mats the Answer?

#### Question

Some laboratories have a mat with bleach solution at the entrance and exit of a BSL-3 suite. Is this procedure useful?

#### Answer

It is time for us all to understand that biocontainment laboratories are not contaminated with the agents that are being used in the laboratory, unless a catastrophic spill occurs outside a containment device. If the lab is always contaminated, then the people who are working in that lab should not be working there and the supervisor or PI should not be allowed to oversee the operation of the laboratory. In a biocontainment laboratory, all work with the agent is performed in the biosafety cabinet or other primary containment device and the floors should not be contaminated at all; therefore, shoes should not be contaminated and generally a mat soaked in bleach solution is not needed.

If there is a spill in the lab that requires cleanup (i.e., a spill outside of the containment device), then there should be a procedure for ensuring that lab personnel's shoes are left in the lab and properly decontaminated prior to being removed from the lab. Even with a spill, a pad with disinfectant at the exit of the laboratory is not needed.

Let's look at this practice from the standpoint of what we know about disinfectants and their action. In order to be effective, a given disinfectant must be in contact with the organisms of concern for an appropriate time, at an appropriate pH and temperature. A significant amount of extraneous organic matter should not be present, as the chemical disinfectant does not distin-

guish between the extraneous organic matter and the microorganisms. In addition, the disinfectant may lose activity over time. Finally, it is known that certain types of microorganisms can actually thrive in weak disinfectants (Gajadhar et al., 2003; Oie et al., 1996; Weber et al., 2007) and these pads, if not frequently changed or replaced, could actually serve as breeding grounds for organisms.

Given that a biocontainment lab worker's shoes are unlikely to be contaminated, and considering the requirements for efficacy of the disinfectant and the considerable amount of extraneous organic matter on a worker's shoes, it is suggested that such pads are a waste of money and it is highly unlikely that the disinfectant pad at the exit of a lab would be useful.

#### Question

Are these pads necessary at the entrance to biocontainment facilities, or useful in minimizing potential contamination in animal facilities?

#### Answer

To answer the first part of this question, let us understand that biocontainment laboratories are not clean rooms. Air flows into the biocontainment facility under and around the doors and there really is no need for them to be any "cleaner" than any other microbiology laboratory. Again, work is done in biosafety cabinets which, when working correctly and used by trained personnel, protect not only the worker and the environment, but also the work. Therefore, there is no need to "decontaminate" the shoes of personnel coming into the facility. In addition, given the information provided above for the "exit" pads, increased contamination could be spread through the improper use and maintenance of these pads.

The answer to the second part of the question regarding animal facilities follows the same logic with regard to potentially increasing contamination from improper use and maintenance. It is better to have dedicated shoes or shoe covers for personnel working with animals than it is to rely on "disinfectant pads."

In writing this article I am reminded that a number of products on the market claim to be helpful in reducing the introduction of dirt, dust, microbes, etc. into supposedly clean areas. Sticky mats that are supposed to, and appear to, remove dirt and microbes from the feet of personnel entering operating rooms and clean rooms come to mind. Daschner and co-workers stated that "useless and unproven methods in hospital infection

control are: environmental cultures, routine cultures of personnel, routine air sampling, fogging and spraying of disinfectants, UV lights, plastic shoe covers, routine floor disinfection, disinfection or sticky mats,..." (Daschner et al., 1987). While these devices appear to be removing dust and dirt from the shoes of personnel, the fact is that once someone has walked on the mat and deposited his or her contamination, the next person stepping on the mat in the same place simply picks up the residue left behind by the first person. To be effective, these mats would have to be removed/replaced after each person enters or exits the area and that does not happen. Remember, if a salesman approaches you with a new and better way to protect your personnel and it looks too good to be true, ask for the data that definitively proves the efficacy of the product. If they can't be produced, don't buy the product.

### Question

Should absorbent pads be used on the work surface of BSCs in BSL-3 laboratories and if so, why?

### Answer

This is one of those interesting procedures that seem to have been introduced into the laboratory and no one seems to know when or how it started and why it should be done except for the fact that "we've always done it this way." In fact, the use of absorbent pads actually pre-dates biosafety cabinets and is probably, if done correctly, a very good practice to minimize the potential for aerosolization of spilled materials.

In October 1952, even before I started working in microbiology, Raymond Anderson and his coworkers at Camp Detrick (now Fort Detrick) in Frederick, Maryland recognized that certain procedures used in the microbiological laboratories might result in the formation of aerosols and the subsequent infection of workers in the laboratory.

In an article entitled "Potential Infectious Hazards of Common Bacteriological Techniques" published in the *Journal of Bacteriology*, Anderson described their research on the potential for infectious aerosol formation due to common laboratory procedures and accidents (Anderson et al., 1952). Among the experiments performed, they examined different procedures that might cause a spill on various laboratory surfaces to determine if aerosols were released. I'll not bore you with all of the

results because I encourage you to read this interesting and historic article for yourself at [www.pubmedcentral.nih.gov/articlerender.fcgi?artid=169381&log\\$=activity](http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=169381&log$=activity). They demonstrated that when certain procedures that resulted in droplets falling on surfaces were performed, less aerosol was created if the droplets fell on damp absorbent towels placed on the work surface. More specifically, they demonstrated that the absorbent material had to be dampened with phenol to significantly reduce the potential for aerosolization. Dry towels produced almost as much aerosol as the solid surface; however, paper towels, wrapping paper, and towels wet with phenol did not result in significant aerosolization. Anderson and his coworkers, while noting this result, did not postulate a reason for the differences.

So, the answer to the question is that not only should we probably be using absorbent pads on the work surfaces of BSCs in BSL-3 labs, but we should also use these pads on all work surfaces for all work done with infectious agents in microbiology laboratories. One must remember, however, that these pads should be removed following the completion of the work and disposed of in a manner consistent with other potentially contaminated materials in the laboratory. In addition, remember that, at least for the absorbent towels, dry towels did not seem to be as effective as damp towels. Perhaps someone should do some research with modern absorbent pads to see if they really work as well as we hope they do. Another argument for applied biosafety research.

### References

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