

BioSide Lines

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The Newsletter of the Office of Biological Safety, UW-Madison Safety Department
www.fpm.wisc.edu/biosafety

Transport Precautions for Large Animals

As many UW-Madison staff can attest to, working with animals presents some interesting challenges, and working with large animals offers additional complications. One of these challenges is transporting animals safely.

An article in the last issue of BioSide Lines (October 2006) recommended precautions for transporting small animals within and between buildings. Many of these precautions are also relevant for transport of large animals: having trained experienced staff do the transport, following Departmental/School standard operating procedures, using dedicated vehicles, etc. Containment is the key to safe transport.

Additional precautions recommended for large animals such as nonhuman primates include:

- Use absorbent pads in the bottom of primary container (e.g., transport cages/boxes) and/or secondary containment (e.g., transport tote).
- Leak resistant secondary containment is needed for transport between buildings and is advisable for brief transport in any public area outside of the animal facility. Minimally, an opaque fluid resistant cover large enough to completely drape the top and sides of the transport cage/box should be used for transport within public areas of a building.
- Elevators dedicated for animal use are preferred for large animals as well as small animals. If common elevators are used, transport of nonhuman primates is not allowed with members of the public; ask them to step out and wait for the next elevator (per School of Medicine & Public Health and Primate Center procedures).
- Secure transport totes in the vehicle to prevent shifting while the vehicle is moving. Fleet vehicles dedicated for primate transport should have separate, sanitizable compartments for animal holding. Such tertiary containment prevents contamination of the vehicle and prevents release of the animal in the event of an accident and/or primary containment failure.
- Bring capture equipment (e.g., net and leather gloves) and exposure kit (for Old World monkeys) in case an accident occurs.
- Clean and disinfect transport cages/boxes and totes after each transport and clean and disinfect transport vehicles routinely (e.g., weekly).
- Never leave an animal unattended. Two people should accompany the animal(s).

This article focuses on transport of nonhuman primates, but many of these same precautions would be appropriate for other large animals such as dogs, pigs, etc. The bottom line is to use precautions that make animal transport safe for everybody.

Longevity of Pathogens on Surfaces

The ability of some pathogens to survive on inanimate surfaces is truly remarkable. A recent article summarizes such information from a review of MedLine literature. The focus of the review is nosocomial infections of concern in health care settings. The findings also have relevance for research settings where many of the same pathogens are handled.

Many bacteria (gram positive and gram negative), fungi, and GI tract viruses can survive months on surfaces. Respiratory tract viruses and bloodborne pathogens do not persist as long. A virus such as adenovirus which can affect both the respiratory and GI tracts can survive for months. The following table provides some conclusions of the review article in rough numbers.

Type of Pathogen	Examples	Duration of Persistence
Most gram-positive bacteria	<i>Enterococcus spp.</i> , incl. VRE <i>Staphylococcus aureus</i> <i>Streptococcus pyogenes</i>	Months on dry surfaces
Many gram-negative bacteria	<i>Acinetobacter spp.</i> <i>Escherichia coli</i> <i>Klebsiella spp.</i> <i>Pseudomonas aeruginosa</i> <i>Serratia marcescens</i> <i>Shigella spp.</i>	Months on dry surfaces
A few gram-negative bacteria	<i>Bordetella pertussis</i> <i>Proteus vulgaris</i> <i>Vibrio cholerae</i>	Days
Mycobacteria & Spore-forming bacteria	<i>Mycobacterium bovis</i> <i>Mycobacterium tuberculosis</i> <i>Clostridium difficile</i>	Months
Fungi	<i>Candida albicans</i>	Months
Most respiratory tract viruses	Corona Coxsackie Influenza SARS Rhinoviruses	Few days
Most GI tract viruses	Astrovirus Hepatitis A Polio Rotavirus	Approximately 2 months
Bloodborne viruses	Hepatitis B HIV	More than 1 week
Herpes viruses	CMV Herpes simplex types 1 and 2	Few hours up to 7 days

The figures given in the article for specific pathogens, however, are often wide ranges that reflect the different test conditions used in different studies as well as variability between different strains of the same pathogen. Thus, *E. coli* can survive from 1.5 hours to 16 months, *Pseudomonas aeruginosa* from 6 hours to 16 months, *Staphylococcus aureus* including MRSA from 7 days to 7 months, hepatitis A virus from 2 hours to 60 days, and vaccinia virus from 3 weeks to >20 weeks.

Important variables that affect persistence include: concentration of pathogen, volume, humidity, temperature, and presence of other materials such as protein or serum.

In light of uncertainty, it pays to be conservative and assume that the worst case scenario is in play. The main route of transmission for many nosocomial pathogens is contaminated hands so frequent hand washing and wearing PPE, such as gloves, lab coats, and protective eyewear, are necessary to protect yourself and others. If you decontaminate surfaces routinely (e.g., daily or after a work session) with an efficacious disinfectant, you can make pathogen persistence a moot point.

Reference

Kramer, A., I. Schwebke, and G. Kampf. 2006. How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. *BMC Infect. Dis.* **6**:130.

Prior Approval for Changes in Animal Housing

Evaluation of the location where experimental animals are housed is integral to the risk assessment that is done in review of the biosafety protocol. This data is entered into Section II of the protocol template, Research Facilities. Prior notification, via written amendment of the protocol, is required for any change such as the location of animal housing that affects containment.

This requirement is based on a policy adopted 10 years ago by the Institutional Biosafety Committee (IBC), which states:

- Any movement of animals from University Facilities that results in a lowering of containment must be approved by the IBC prior to move.
- Any movement of animals from one University BL3 facility to another must be approved by the IBC prior to move.
- The Office of Biological Safety must be notified of any movement of animals from one University BL2 facility to another University BL2 facility. It is the responsibility of the Principal Investigator to assure that this notification occurs.

When in doubt about this requirement, give staff at OBS a call (3-2037).

PPE Inside And Outside of the Workplace

A subtitle for this article should be, "Why does your biosafety officer get mad when she sees gloves and lab coats worn in public areas?" The answer is simple. These items of personal protective equipment (PPE) are worn to protect the worker from contaminants, and those contaminants must be left behind in the lab. The basic rule for safety and courtesy is to remove your gloves and lab coat before you walk into the common corridor. Please remind your colleagues to do the same.

Protecting yourself from the potential hazards with which you may be working in the lab is fundamental to safety. Gloves prevent the skin of your hands from coming into contact with hazardous materials, and the lab coat protects other skin areas and keeps your clothes clean so you don't take the hazardous materials home. Even if you know that your protective equipment is clean, the folks you pass in the hallway will perceive that you may be spreading hazards as you go.

Many routine lab activities release particles and aerosols, depositing the substance (e.g., chemical or microbe) in the surrounding area. Effective use of PPE prevents further spread. If work is conducted with hazardous materials, you should assume it will end up on PPE (or on your hands and personal clothes if you don't use PPE). Gloves are probably the PPE item that get contaminated most readily and pose the greatest risk of spreading it further. Gloves should be taken off and hands washed, not only before leaving the lab, but also between activities, such as before answering the phone, using a microscope, or opening drawers, incubators, and other equipment.

Various measures can be taken to avoid exposing yourself to contaminants when hazardous materials must be transported outside of the lab. A commonly encountered situation is transporting bags of biohazardous waste to the autoclave. Use of a cart and/or placing the material in a clean secondary container, such as a tray, avoids the need to wear PPE. Put a clean pair of gloves in your pocket if they are needed at a destination.

There may be instances where you feel more secure wearing your lab coat outside of a lab, such as when transporting materials between labs, and other instances where it is not practical to remove your lab coat, such as when moving between nearby labs. Some individuals, however, seem to believe that a lab coat improves their personal image and will not only wear them outside of the lab, but also for social functions, such as having lunch with colleagues at a restaurant. The image of inappropriate use of PPE that comes to a biosafety officer's mind is "Pig Pen", the messy Charlie Brown cartoon character, who left a cloud of dirt everywhere he went.

It's simple: Keep yourself and others safe (and your biosafety officer happy) by wearing your PPE in the lab and removing it before you leave the lab.

Containers for Transporting Biohazardous Materials on Campus

What is the standard of care a person should follow for transporting infectious substances between labs within and between campus buildings? Federal regulatory standards for shipping infectious materials in commerce specify package characteristics including leak proof primary and secondary containers that meet test requirements such as pressure and puncture resistance criteria. The packages go through a certification process that verifies that they meet high standards; they are expensive to purchase, but are not required when personnel transport materials on campus.

A slightly less stringent standard of care for transport of infectious materials may be used when a commercial carrier is not involved. The materials should be packaged in leak proof primary and secondary containers, with sufficient absorbent material to deal with a spill. It is feasible to use a much less expensive outer container since the certification criteria do not apply. The box should be constructed with materials that withstand routine chemical disinfection. A couple options are described here.

- Marine supply and sporting gear outlets offer boxes to protect valuable gear in wet conditions. The containers have a water resistant O-ring seal, tongue and groove lid, a storage compartment in the lid (good for a description of the contents, gloves, etc.), a large handle, and heavy-duty bailed latch. A search on the internet using the keywords “Plano Marine Box” shows them to be relatively inexpensive.
- Nalgene makes a “BioTransport Carrier” that is available from Fisher Scientific and other suppliers of laboratory equipment. The product is described as having been designed for the purpose of safely transporting potentially infectious materials. It is a closed-system carrier made of polycarbonate (break resistant) and designed to accommodate test tube racks. The clamps securely hold the carrier closed and assure a leak-resistant seal.

Remember, these containers must not be used when shipping pathogen cultures and other materials that are classified as dangerous goods via a commercial carrier. Contact OBS for more information regarding certified shipping containers.

Health Canada Material Safety Data Sheets (MSDS)

If you're using a hazardous chemical, OSHA regulations require that a MSDS is available that informs staff of the hazards associated with that chemical and of the appropriate handling precautions and disposal methods. Such information also is valuable for hazardous biological agents, but where can this information be obtained?

Health Canada is a useful resource that provides MSDS for many infectious agents (<http://www.phac-aspc.gc.ca/msds-ftss/index.html>). Health Canada MSDS can be used as the pathogen-specific component of biosafety manuals, for training staff, as an information sheet that accompanies staff to the emergency room in case of exposures, and as the required MSDS for shipping of infectious substance.

Cut and Bite Resistant Gloves

Some of the most common injuries resulting from research activities are animal bites and scratches. Leather gloves have been available for a long time but aren't as protective as many would like. New products are available that reduce the chance of a puncture wound from bites or scratches. The choice of glove material includes steel mesh, Kevlar®, Dyneema®, and Spectra®.

The various materials have different properties. Kevlar is five times stronger than steel on an equal weight basis, resistant to high temperatures, and is self extinguishing when exposed to a flame. One drawback is that Kevlar is sensitive to bleach and should not be exposed to it. Dyneema is fifteen times stronger than steel, is a very light fabric, and is impervious to bleach. Its major drawback is that it has little heat tolerance and melts at 145° C. Spectra is ten times stronger than steel, very light, impervious to bleach, but melts at 150° C. Steel mesh can take a challenge of heat, but should not be exposed to bleach, and is rather heavy to wear.

A glove that is now in use in some UW-Madison animal facilities is the Surgipath® cut resistant glove. It is made from Spectra and has good reviews by the users. This glove may be worn in combination with other protective gloves like latex, nitrile or vinyl. The manufacturer states that the glove can be bleached or autoclaved. Their product website is: www.surgipath.com/region/us/product.aspx?p=123

A new product line recently came to our attention. It is a specially made glove-gauntlet system designed specifically for animal work. The company is called the BiteBuster Protective System™. The matrix of the BiteBuster glove is woven from Kevlar, which is then covered with a laminate of nitrile. This combination helps protect from both a bite-wound and most chemical absorption. The company also claims that dexterity and tactile sensitivity are not compromised. Their “Extreme Gauntlet” with 22 mil nitrile underliner has been tested and withstood a puncture pressure greater than 150 Newtons. BiteBuster states that the glove is cleaned by washing with soap and water. To view their catalog website go to: www.bitebuster.com.

Cut resistant gloves may have broader applications besides animal handling. Some situations where staff work with both hazardous materials and sharps could benefit from such gloves that are resistant to cuts and punctures.

Cut resistant gloves won't protect you from all cuts and punctures and can't protect you from a needlestick, so it remains important to reduce the use of sharps whenever possible and use appropriate precautions.

Inactivating Bleach

One of the most useful chemical disinfectants is common household bleach. Bleach is inexpensive and has a broad range of activity against pathogens. Bleach, however, has some drawbacks and there are situations where it is desirable to inactivate it. Bleach is highly corrosive and will ruin steel surfaces after prolonged contact. Residue of the chemical may kill what you want to cultivate after treatment. Materials that have been treated with bleach should not be autoclaved because chlorine gas may form. There are some situations, such as decontaminating absorbent material after a spill of blood, where autoclaving will ensure that it is safe to discard as routine trash. So how does one inactivate bleach?

Sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) inactivates bleach quickly. It is a colorless crystalline compound that is more familiar as the pentahydrate, sodium hyposulfite or “hypo” ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$), also a crystalline substance. Thiosulfate reduces the hypochlorite (active ingredient in bleach) through oxidation to sulfate. The complete reaction is: $4\text{NaClO} + \text{Na}_2\text{S}_2\text{O}_3 + 2\text{NaOH} \rightarrow 4\text{NaCl} + 2\text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$. The sodium hydroxide is added to the bleach solution by the manufacturer to slow degradation of sodium hypochlorite during storage.

Guidance on the web and from other sources is generally lacking about how much sodium thiosulfate is needed to inactivate a solution containing bleach. Certainly, the amount will vary depending on the nature of the material containing the bleach. A rough estimate should be sufficient. We recommend preparing a 0.2M solution of sodium hyposulfite or thiosulfate and adding a volume that is equal to the volume of undiluted bleach stock (assuming 5.25% NaOCl) used. Remember that once bleach is inactivated by thiosulfate it no longer works as a disinfectant.

Besides disinfection, a number of chemicals including many chemotherapeutic agents can be inactivated by using bleach followed by thiosulfate. Surface Safe is a commercially-available product containing these two substances in the recommended concentrations and is designed for cleaning surfaces in and around areas where chemotherapeutic agents are mixed and administered.

Shipping Infectious Substance and Other Biological Materials

The Office of Biological Safety will provide training and certification for shipping Infectious Substance and other biological materials, with a focus on safety and regulatory compliance for research laboratories. The Department of Transportation requires that persons involved in shipping hazardous materials in commerce be trained and certified in proper handling of these materials.

Tuesday, January 16, 2007

Union South 9:00 – 11:30 a.m.

Refreshments will be served.

All staff are welcome to attend this class for initial training or re-certification. Computer-based training is available only for those who attended the class for their initial certification.

HazMat Packaging Workshop

An optional hands-on HazMat packaging workshop will be offered after the regular HazMat Shipping class. Trainees will decide how example materials should be shipped (e.g., Infectious Substance; Biological substance, category B; Exempt patient specimens) and then will package the surrogate materials in appropriate containers. Feedback and tips on packaging will be provided. People with current HazMat certification may register for the workshop only.

Tuesday, January 16, 2007

Union South 11:30 a.m. - 12:30 p.m.

Basic Biosafety Class Offered

This class will give an overview of basic biological safety. Topics include biosafety levels and biohazard containment, good microbiological techniques, waste disposal, risk assessment, and emergency preparedness. It is intended primarily for students and staff who are new to this institution and/or new to working with biological materials. Everyone is welcome to attend.

Thursday, January 18, 2007

Health Sciences Learning Center

1:30 – 3:30 p.m.

Advanced Biosafety Training

This class builds on the Basic Biosafety class and focuses on biosafety level 2 (BSL-2) precautions and containment in lab and animal research. Topics include risk assessment, proper use of containment equipment and personal protective equipment, and disinfection procedures for various types of Risk Group 2 pathogens (viruses, bacteria, fungi, parasites, prions). A major goal of the class is to provide safety information on commonly-used viral vectors since viral vectors are becoming a widespread research tool. The Basic Biosafety class should be taken prior to the Advanced Biosafety class either by attending a Basic Biosafety class or by reviewing the training available at the OBS website.

Tuesday, February 13, 2007

Union South 1:00-3:30 p.m.

Registration is required for these courses.

Contact OBS at 263-2037 or biosafety@fpm.wisc.edu

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