

Rodent Biosecurity at the University of Pittsburgh

Introduction

Rodent biosecurity, intended to protect rodents used in research from infectious agents and parasites, impacts the animals, the personnel in contact with them, and the research.

Maintaining Specific Pathogen Free (SPF) rodent populations protects the animals' health and welfare, as infectious agents and parasites can cause morbidity and/or mortality. Rodent biosecurity also affects personnel safety as some organisms that infect or parasitize rodents may be transmitted to humans. Finally, infection or parasitic infestation of a rodent colony may affect research results. Even an infection that does not cause apparent illness can act as a variable affecting many biological functions including, but not restricted to, physiology, metabolism, and proper immune responses.

Practicing high standards of rodent biosecurity are thus clearly in the interest of the research community of the University of Pittsburgh. The DLAR wishes to collaborate with investigators who are using rodents in their research in achieving and maintaining the high standards of biosecurity that are necessary to support excellence in rodent related research. In an effort to assist investigators in implementing effective biosecurity the DLAR has compiled an overview of biosecurity risk factors and the current guidelines and procedures for their mitigation.

Rodent Biosecurity Risks

There are risk factors of varying type and extent that pose a threat to the rodent biosecurity at the University of Pittsburgh. The more important ones are:

Rodent pathogens on campus: Currently, there are no rodent pathogens known to adversely affect research results found present in campus rodent colonies (except for some biocontained mouse colonies at CLC). While careful management procedures such as following traffic patterns within rodent facilities and interfacility quarantine/testing for rodent transfers minimize the risk of spread of rodent pathogens on campus, the possible insidious reoccurrence of these agents remains a direct risk to uninfected colonies.

Rodent pathogens in shared research support areas: The limited availability of high end animal or human diagnostic and testing equipment (e.g. PET, MRI, NMR, CBBC, microscopy, behavioral cores) lead to these resources being readily obtained and utilized in collaborative research activities or at biomedical core facilities throughout the local research community. The regular introduction of rodents or rodent derived samples originating from various animal facilities as well as the frequent visits from investigators from many different research labs facilitate a potential contamination of these areas with rodent pathogens.

Rodent pathogens in rodent colonies of nearby campuses and alternate facilities: There exists a distinct possibility of rodent pathogen outbreaks occurring in animal facilities of nearby campuses or alternate facilities. Investigators who through collaborative research are in direct or indirect contact with these rodents should be cognizant of the rodent health status on the nearby campus or alternate facilities in question and take appropriate precautions to prevent spread of rodent pathogens from one campus or facility to another.

Rodent pathogens in rodent colonies of outside institutions from where mice are imported: This is a frequent occurrence. Introduction from these sources is prevented by careful screening of the health status and surveillance reports of an outside institution in question and the mandatory quarantine and testing of imported mice before allowing transfer to an animal housing and use facility.

Rodent pathogens in vendor colonies: Commercial approved vendors practice continuous health status monitoring, protective housing and high management standards with prompt reporting of suspected rodent outbreaks. Animals from these sources are assumed to be clean and are allowed into animal rooms without quarantine and testing. However, a minor degree of risk remains.

Rodent pathogens in pets at home or wild rodents: Pet rodents are almost never tested for pathogens. It should thus be assumed that both pet rodents and wild rodents are carriers of one or more pathogens that

are excluded in the rodent colonies at the University of Pittsburgh. Any direct (e.g. with pet rodents) or indirect (e.g. accidental contact with fecal droppings of wild rodents when cleaning out the garage) contact with these rodents carries the risk of introducing pathogens into University colonies if no preventative or decontamination measures are applied. An integrated Pest Monitoring and Management Program is in place in all DLAR animal facilities.

Rodent transfers on campus: Each interfacility, or even room to room, transfer of rodents bears some risk because an emerging pathogen outbreak may not yet have been detected in the source animal room at the time the transfer takes place. The pathogen may thus be introduced to a room that thus far was free of the pathogen in question.

Cross trafficking: Under the existing conditions at the University, cross trafficking is often unavoidable and occurs frequently. It can be defined as personnel entering and leaving different animal facilities, facility corridors, animal rooms, procedure labs and/or PI labs with animal use sites within a short time span (one week). As all DLAR animal facilities, and often also corridors and rooms within each facility, are maintained as separate entities with regard to the health status of the animals housed there, cross trafficking poses the distinct risk of carrying an as yet undetected rodent pathogen from one site over to another.

Fomites: Any inanimate, contaminated object or substance may potentially transfer a rodent pathogen from one place to another. The associated risk is similar, and often connected, to that of cross trafficking with the added risk of the possible cage to cage transfer of pathogens.

Biologicals (cell lines, antibodies, etc.): Any type of biological substance that at some point in time was in contact with or derived from rodents must be considered suspect for contamination with rodent pathogens.

Inadequate adherence to garb requirements, designated traffic patterns within facilities, required use of biosafety hoods and wait periods between visits to different animal facilities. Negligence in adhering to carefully designed preventative measures for the control of transmission of pathogens can significantly increase the risk associated with the risk factors mentioned above.

Inadequate techniques used in disinfection of instruments, decontamination of equipment, procedure labs and other animal use sites, and handling microisolator caging. If inappropriate methods are used or procedures are carried out incorrectly then, similarly to inadequate adherence, the risk associated with the risk factors mentioned above may rise significantly.

Implications

Despite strict policies on rodent importation and quarantine and careful management practices, the rodent colonies on campus remain vulnerable to new outbreaks due to the many risk factors and special conditions that exist in the University's research environment.

Recommendations and Requirements

The DLAR recommends or requires the following methods to minimize the risk of pathogen transmission:

1. Personnel should adhere to protective procedures already in place. One should be aware of the order of rooms one enters throughout the day (traffic patterns), including animal rooms, labs, and cage wash and cage storage areas. Personnel must change garb following the requirements laid down for each separate animal facility, facility corridor, animal room, procedure lab, animal use site in a PI lab, shared resource facility or satellite animal facility.
2. Disinfection or decontamination of all use areas and equipment coming in direct contact with animals or caging systems must be carried out both pre and post utilization (analogous to routine decontamination procedures when utilizing a cell culture hood).
3. Prompt and adequate disinfection or decontamination of PI lab spaces in which animals are used must be part of laboratory routine. For mitigation of risk associated with crosstrafficking, all lab personnel and visitors should be (made) aware of the source housing facility of the rodents used in the lab. Fomite transmission may be controlled by having dedicated instruments and equipment for each use site, or by adequate disinfection of the same before transfer to a new use site.

4. Personnel who in the course of their work necessarily have to visit different animal facilities must observe a wait period of 48 hours after leaving the one facility and before entering the next. It is additionally required to minimally take one shower and change one's street clothes. Personnel who unavoidably have to enter and leave different animal facilities in the course of one day are required to take a shower and adhere to the special garb requirements as reviewed and approved by the facility supervisor for these occasions.
5. Personnel should refrain from keeping rodent pets at home. If accidental contact with wild rodents occurs then the requirements as described above for visiting different animal facilities should be followed.
6. Investigators wishing to transfer rodents from their assigned animal housing room to another animal room or facility are required to complete an Animal Transfer Approval Form. For approval of a transfer between facilities, the completion of an interfacility quarantine and testing procedure of approximately 6-7 weeks duration is normally required.
7. Investigators wishing to import rodents from other institutions (non-approved sources) are required to complete an Animal Shipment Application Form. If, after review of the health status and surveillance reports of the outside institution, importation can be approved a quarantine and testing procedure of the imported mice of approximately 12-13 weeks duration is required before allowing transfer to an animal housing and use facility.
8. Because the production processes of biologicals are often unknown but may entail contact with contaminated equipment or substances it is necessary to ensure that biologicals which are to be used in live research rodents are free of pathogens known to interfere with research results or having zoonotic potential. This is achieved by requiring for each biological that either a relevant manufacturer's quality control certificate is submitted or is laboratory tested for the absence of rodent pathogens.

Additional Information

For further information, please contact Dr. Joseph Newsome (e-mail: newsomej@dlar.pitt.edu or phone: 412 648-8950) Attending Veterinarian and DLAR Clinical Director, or one of the other DLAR clinical veterinarians (e-mail: dlar@pitt.edu or phone: 412 648-8950).

Animal Transfer Approval and Animal Shipment Application forms may be downloaded from the IACUC website http://www.iacuc.pitt.edu/forms/forms_open.asp

References:

http://www.iacuc.uiuc.edu/policies/rodent_biosecurity.html