Rodent Colony Health Monitoring

A. Purpose and Responsibility

1. The purpose of the rodent health monitoring program is to evaluate the health status of incoming and existing specific pathogen free (SPF) rodent colonies at Washington State University; to rapidly detect an infectious disease outbreak within these colonies and to prevent disease transmission between colonies due to animal transfers within the WSU campus and from external sources. For information regarding incoming rodent shipments, please refer to section #8 below for guidelines for entry and quarantine of rodents from non-commercial sources.

2. The rodent health surveillance program is administered by the Office of the Campus Veterinarian (OCV) with coordination and cooperation from principal investigators and vivarium management.

B. Guidelines

1. Recommended surveillance:

   Rodent health surveillance is highly recommended for all long-term rodent colonies with rats, mice, hamsters, guinea pigs, gerbils and other rodents and is mandatory in SPF vivariums. Short-term rodent colonies will be evaluated by the Office of the Campus Veterinarian to determine if they are exempt from surveillance depending on their health status, housing, use and origin. The following are examples of criteria that may result in a colony being determined as exempt from surveillance.

   a. The colony will only be in existence for 4 weeks or less
   b. All of the animals within a short-term colony will be eliminated and the room completely emptied and sanitized before any new animals are placed
   c. Animals from the untested colony will not share laboratory space or equipment with animals from long-term colonies
   d. The colony animals will be treated with hazardous agents or substances that may contaminate the sentinel animals and pose a health risk to animal care personnel.

2. Direct Sampling of Colony Animals for Rodent Pathogens:

   Colony animals may be tested directly by various methods including PCR on tissue, feces or pelt swabs, serology, fecal examination and anal tape testing for internal parasites, necropsy with histopathology and pelage
examination for external parasites. Direct testing in often conducted on newly imported quarantine animals or during an outbreak investigation but it is cost prohibitive to do direct sampling in large rodent colonies in which case, environmental or sentinel rodent testing would be used (see below).

3. Environmental Sampling for Rodent Pathogens:

PCR-based diagnostic tests are available for numerous rodent viruses and bacteria as well as internal and external parasites. Pathogens can be detected by swabbing room and equipment surfaces that accumulate dust within an animal room. Examples of these surfaces are ventilated rack plenums, cage changing stations and exhaust vents. PCR-based environmental sampling may be used in replacement of or in addition to direct colony animal or sentinel rodent testing.

4. Use of Sentinel Animals for Detection of Rodent Pathogens:

a. Origin:
   Sentinel rodents should originate from approved commercial SPF rodent vendors and be free of known pathogens. The Office of the Campus Veterinarian will review the use of sentinel rodents from other sources such as in-house breeding colonies on a case-by-case basis. Sentinel animals from reputable sources are not routinely tested prior to the exposure period.

b. Species & gender:
   The sentinel rodents shall be the same species as the colony to be evaluated (i.e. rat colonies should have rat sentinels). For exotic rodents for which there are no direct serological tests available, the closest-related rodent will be used as a sentinel (i.e. deer mouse colonies have mouse sentinels). Female mice and rats and male hamsters are preferred because of their reduced incidence of aggression and injury.

c. Strain:
   For mice and rats, outbred females such as CD-1 and Swiss (mice) or Sprague–Dawley (rats) are recommended because of their robust immune response. Other mouse and rat strains may be used if they are determined acceptable by the Office of the Campus Veterinarian. Some inbred rodent strains have immune deficiencies and varied disease resistance so are ineffective sentinels.
d. **Age:**

Mice and rats should be placed between 3 to 5 weeks of age. After placement, the sentinels must be exposed for a minimum of eight weeks.

e. **Number of Sentinels and Identification:**

There shall be a minimum of one cage of two co-housed sentinel mice or rats per full standard rack or one sentinel cage per side for a full ventilated rack. In general, this results in one sentinel cage per 50-80 mouse cages or 30-50 rat cages. In multiple investigator rooms housing rodents in closed micro-isolator caging, each investigator colony should have its own sentinel cage.

Two sentinels are used per cage so that (1) there is a spare if one animal dies during the monitoring period, (2) one animal can be tested and serum from the second animal saved in the event of an equivocal or positive result from the first animal, and (3) to provide social housing for social species in accordance to the WSU IACUC Environmental Enrichment Policy.

Sentinel cages must be labeled with the strain, source, date of sentinel placement and initial exposure, exposure type (see #5: 100% bedding, rotation, or direct), date of birth, sex & ASAF number. The cage card should indicate the sentinel rodents are not to be used for any research purpose.

f. **Caging, Housing, and Handling of Sentinel Rodents:**

Sentinel rodents should be housed similarly to the standard housing of the room. If the colony is housed in open-top rodent cages, sentinels should be housed in open-top cages (i.e. without micro-isolator tops) on the bottom of the rack. Colonies with closed micro-isolators or ventilated cages shall have sentinels in closed micro-isolators or ventilated housing with the same bedding and feed as the experimental rodents in the room. Sentinel rodent cages shall be placed on the lowest shelf of the rack under the experimental rodents. All sentinels should be provided caging enrichment as described in the WSU IACUC Environmental Enrichment policy.

Handling of sentinel animals (e.g. cage changing, examination, etc.) should be performed after care has been provided for all other animals in the room. Once a group of sentinel rodents has been placed in a room on a particular rack, they must remain with that same group of animals. Sentinels shall not be moved from room to room and/or rack-to-rack between different populations/sources of rodents.

g. **Exposure:**

*Dirty Bedding sentinel sampling:* The most commonly used surveillance method is indirect surveillance using dirty bedding. Sentinel rodents are to be housed on a composite sample consisting of 100% dirty bedding from colony cages for a minimum period of 8 weeks from the first exposure. EVERY TIME the cages are changed in
the room, small samples of dirty bedding (i.e. 5-15 ml or 1-3 teaspoons per cage) should be removed from every experimental rodent cage and placed in the sentinel rodent cages. Longer exposures of 10-12 weeks are encouraged and improve the likelihood of detecting an infection.

If a large number of cages need to be sampled into a single sentinel cage, the use of a rotation system can be discussed with the OCV veterinary staff. If a rotation system is used, it is critical that all the cages within the colony are sampled within 4 weeks to allow seroconversion to occur in the sentinel animals before they are tested. The composite sample should always include feces and urine. If sentinel animals are maintained in 100% dirty bedding as described, the sentinel rodent bedding should never look clean. This ensures the sentinel rodents are exposed to any and all potential pathogens in the room.

**Direct contact and direct colony sampling:** Some viruses and agents are poorly transmitted through contaminated bedding (Helicobacter, mouse norovirus and some external parasites). If needed, contact sentinel animals which share the housing with the colony animals or colony animals themselves may be tested.

**Replacement of Sentinels:** When sentinel rodents are removed quarterly by the OCV Staff for routine rodent health monitoring, new replacement sentinel rodents should be placed within 1-2 weeks to maximize the exposure period for the next quarter.

### 5. Testing Frequency:

In most WSU SPF vivariums, OCV will test for rodent pathogens quarterly using one or more of the following testing strategies: PCR-based environmental sampling, direct colony animal sampling or sentinel rodent testing. If using rodent sentinels, the testing of SPF mice, rats and related rodent species includes quarterly serology for viruses and bacteria with fecal examination and anal tape testing for internal parasites and annual necropsy with histopathology and pelage examination for external parasites. All sentinel animals should have a minimum of 8 weeks of exposure before testing to allow time for seroconversion and to develop a detectable parasite infestation. PCR testing for various disease agents will be conducted as needed using environmental sampling, direct colony animal sampling and/or sentinel rodent sampling.

OCV will process sentinels quarterly (every 3 months) to provide maximal opportunity for seroconversion and parasite development. One sentinel per cage will be tested and the remaining sentinel will be euthanized and bled for serum banking. In the event of a positive or equivocal serology result, the banked serum will be tested. A summary of the Rodent Health Monitoring results for all vivariums will be sent to all rodent users and vivarium managers.
6. In The Event of Positive Results:

OCV will retest any unexpected positive or equivocal test results when possible whether from environmental sampling, direct colony animal sampling or sentinel rodent testing. Once an outbreak is confirmed, OCV will institute quarantine on the affected colony and take steps to identify the source and extent of the outbreak and to eliminate/control the infectious agent. It may be necessary to establish a “zone of suspicion” around the affected area. This may extend into the laboratories in other parts of the building or campus. Suspect rooms will be under increased scrutiny. It may be necessary to re-derive or restock the colony.

7. Entry and Quarantine of Rodents from Non-Commercial Sources
a. Non-Commercial Sources:

Non-commercial sources include colleges, universities, research facilities, medical institutes, pet stores, trapped wild rodents and any other source that is not an OCV approved SPF vendor. Approved vendors include Charles River Laboratories, Taconic, Harlan, Jackson Laboratories & Simonsen.

b. Prior to Shipment:

Before rodents are shipped to WSU, the following information should be sent to OCV to determine the disposition of the incoming shipment:

- The proposed final location of rodent housing (room number and building)
- The proposed length of time the animals will remain at WSU and animal use.
- Any serology, parasitology and bacteriology results from the original colony at the non-commercial source covering a minimum of a year prior to shipment.
- A description of the rodent health monitoring process at the non-commercial source including frequency of testing, surveillance method & diseases monitored.

c. Approval:

OCV will evaluate the health status of the animals and determine the appropriate quarantine and treatment procedures and facility order of entry before approving the animal shipment. We strongly discourage investigators from acquiring animals with known contaminants. In addition, investigators must have prior approval from the WSU IACUC before any animal acquisition and use.
d. **Housing of Quarantined Animals:**

Quarantined rodents should be housed away from colony animals to prevent cross-contamination. Quarantined animals are considered suspect for infectious diseases so should not be moved into colony rooms, procedure rooms or laboratories and personnel must follow recommended containment procedures including PPE and order of entry.

e. **Testing:**

Testing will be either direct sampling on the imported animals or by sampling dirty bedding exposed- or contact sentinel rodents. For sentinel use, two sentinel rodents will be placed with the imported animal shipment for a minimum of 6 weeks for dirty-bedding or contact sentinel surveillance as described in section #5. OCV may require longer quarantine periods for treatment and optimal sentinel exposure. At the completion of the exposure period, one of the two sentinels will be tested and the remaining sentinel will stay with the imported animals until the testing results are complete in the event that retesting is required.

f. **Results:**

Once the testing results are complete, OCV will indicate whether the animals may be released from quarantine and placed with the existing WSU colony. In the event of positive testing results, it may be necessary to re-test, treat, re-derive, or re-order the shipment.

g. **Cost:**

Principal Investigators (PI) acquiring rodents from non-commercial sources with the intent to house them in WSU facilities are responsible for the costs of diagnostic testing incurred for the health evaluation as well as the quarantine per diem charge and treatment costs. The PI is also responsible for the cost of re-derivation of the colony if that is deemed necessary.

8. **Contact Information**

If you require any help or clarifications, please call:

- Office of Campus Vet: 509-335-6246
- Biosafety Officer: 509-335-9553
- IACUC Office: 509-335-7951