I. PURPOSE
   A. This document provides the information required to effectively treat a fur mite contamination at the University of Michigan.

II. DEFINITIONS

Table 1. Fur mite species differences

<table>
<thead>
<tr>
<th>Fur Mite Species</th>
<th>Life Cycle</th>
<th>Morphology</th>
<th>Species infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocoptes musculinus</td>
<td>8-14 days</td>
<td>3rd and 4th legs heavily chitinized; Eggs occupy ½ of abdomen</td>
<td>Mice</td>
</tr>
<tr>
<td>Myobia musculi</td>
<td>21-23 days</td>
<td>Single claw on 2nd digit</td>
<td>Mice and Rat</td>
</tr>
<tr>
<td>Radfordia affinis</td>
<td>Similar M. musculi</td>
<td>Two claws on 2nd digit (unequal length)</td>
<td>Mice and Rat</td>
</tr>
<tr>
<td>Radfordia ensifera</td>
<td>Similar M. musculi</td>
<td>Two claws on 2nd digit (equal length)</td>
<td>Rat</td>
</tr>
</tbody>
</table>

Table 2. Treatment summary

<table>
<thead>
<tr>
<th>Treatment Drug</th>
<th>Dose</th>
<th>Schedule</th>
<th>Cage Labeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivermectin water</td>
<td>12ppm ad lib 0.28cc / 8oz of water 1.2cc / L of water</td>
<td>Continuously for 8 weeks</td>
<td>Yellow acetate with green label indicating ivermectin water</td>
</tr>
<tr>
<td>Ivermectin chow</td>
<td>12ppm ad lib</td>
<td>Continuously for 8 weeks</td>
<td>None</td>
</tr>
<tr>
<td>Moxidectin (topical)</td>
<td>Mouse - 3µl Rat - 10µl</td>
<td>Application on days 1 and 10</td>
<td>Yellow acetate with green label for recording 2 treatment dates</td>
</tr>
<tr>
<td>MiteArrest</td>
<td>Cotton balls per animal: Mouse – 2 Rat – 5</td>
<td>8 weeks with weekly change</td>
<td>Yellow acetate with green label for recording 8 placement dates</td>
</tr>
<tr>
<td>Selamectin (topical)</td>
<td>10mg/kg Mouse - 5 µl Rat – 20 µl</td>
<td>Application on days 1 and 10</td>
<td>Yellow acetate with green label for recording 2 treatment dates</td>
</tr>
</tbody>
</table>

III. RESPONSIBILITY
   A. Veterinary Resident
1. Follow the Rodent Outbreak flowchart (Bluestorage: ULAM\ULAM_RESIDENT\Outbreak Documents).
2. Coordinate screening of uninfected PIs in the positive room with the ULAM Technical Services Team (TST) and area faculty veterinarian.
3. Coordinate euthanasia or treatment of infected colonies with the PI and appropriate ULAM staff.
4. Coordinate post-treatment testing with the ULAM TST and area faculty veterinarian.

B. Husbandry
1. Make necessary husbandry changes (see Section V).
2. Administer the treatments, if the PI elects for them to do so. Charge for drugs used, tech time, and racks treated (see Section VII).

C. Veterinary Technician
1. Assist in training the PI and lab staff in treatment administration if they elect to conduct the treatment.

D. Technical Service Team
1. Work with the veterinary resident to coordinate testing of other PIs in the contaminated room.
2. Work with the veterinary resident to coordinate post-treatment testing.
3. Test animals using the procedure outlined in the “Surveillance of Rat and Mice Ectoparasites,” Section IV. A. 3.

E. PCAR-ADL
1. Examine all slides submitted for fur mite testing by the Technical Service Team.
2. Submit PCR samples to appropriate diagnostic lab.

IV. HUSBANDRY PROCEDURES

A. The contaminated room obtains “red status”, thus no animal movement in or out of the room, unless euthanized, will be allowed.
1. The contaminated room must be entered last and scrubs changed when room is completed.

B. Room pressure changes should occur according to the CODA Worksheet (Bluestorage: ULAM\ULAM_CAFE).

C. Handle animals from the known positive PI in the room last.

D. Minimum PPE includes a disposable gown and gloves. Change gloves between different PI's animals.
E. During the treatment period, contact the area veterinary technician immediately if adverse clinical signs, related to the treatment, are observed. Common adverse clinical signs include: ataxia, tremors, seizures, comatose state.

F. Upon treatment completion, the contaminated room obtains “yellow status”, allowing live animals to move out of the room for research purposes. No new animal introductions are allowed.

G. Upon negative post-treatment testing results, the room obtains “green status”, allowing unrestricted animal movement in and out of the room.

V. COLONY SCREENING AND TREATMENT GUIDELINES

A. Positive colonies may be identified via the following methods:

1. Individual animals may be identified as fur mite positive during work-up of dermatologic lesions by the veterinary staff.

2. Caging equipment (e.g., ventilated rack) may be identified positive via the “Environmental Fur Mite Sampling & Testing Procedures” SOP.

B. If caging equipment (e.g., a rack) or colony is positive, all other PI colonies in the room must be screened for fur mites. Screening of the positive PI’s animals may also be conducted.

1. All cages or a percentage of cages in the colony will be screened at the discretion of the area veterinary resident and faculty veterinarian. Historically, 20% of the colony is tested.

   a. Sampled animals must represent all strains utilized by each PI.

2. For fur pluck screening, preferentially sample animals with dermatologic lesions.

   a. For procedure, reference “Surveillance of Rat and Mice Ectoparasites”.

   b. ULAM PCAR will assess the samples.

3. Screening via PCR can also be conducted.

   a. For procedure, reference “Surveillance of Rat and Mice Ectoparasites”.

   b. ULAM PCAR will submit the swabs to appropriate diagnostic laboratory.

C. All PIs with animals testing positive must euthanize the animals or consult with the veterinary staff for treatment options.

1. All positive PIs involved must be informed of potential side effects of treatment.

   a. PIs electing to conduct the treatment themselves must be trained.

2. Mice belonging to other PIs in the room that test negative will not be treated.

VI. ECTOPARASITE TREATMENT OPTIONS
*Note: Due to the possible adverse reactions associated with the use of the drugs listed below, test and monitor small subgroups of each strain and age for adverse reactions prior to treating the entire group.

A. Standard therapy

1. Ivermectin water (standard therapy)
   a. Treatment duration: *ad libitum* for 8 continuous weeks
   b. Mixing the formulation:
      i. The source of oral ivermectin (Ivomec) must have a concentration of 10 mg/ml (1%)
         - Mix 1.2 ml of ivermectin (1%) with 1 liter of water to provide the appropriate concentration of Ivermectin for treatment. If individual water bottles are mixed, add 0.28ml of ivermectin for each 8oz of water (0.56ml for 16oz bottles).
      - If incorrectly mixed, highly concentrated solutions of ivermectin will precipitate out.
   c. Mix the solution immediately prior to treatment.
   d. Ivermectin water may be administered in bottles or in a carboy for whole rack administration. When placed on top of rack-mounted blowers, place carboys into plastic bags so that water does not leak onto the blower.
   e. Change water bottles at least once weekly in all mouse cages.

B. Alternative therapies

1. Ivermectin chow
   a. Specially compounded version of standard ULAM diets, formulated to 12ppm ivermectin and blue dye for identification purposes.
   b. Treatment duration: *fed ad libitum* for 8 continuous weeks.

2. Topical Moxidectin
   a. Two treatments with 10 days between each treatment
   b. For mice:
      i. Apply 3 μl of topical moxidectin (0.5% Cydectin) to the skin on the dorsum of each mouse between the scapulae.
   c. For rats:
      i. Apply 10 μl of topical moxidectin (0.5% Cydectin) to the skin on the dorsum of each rat between the scapulae.

3. MiteArrest (permethrin)
   a. Treatment duration: 8 continuous weeks
   b. For mice:
i. Add two MiteArrest balls per mouse to the cage.

ii. Replace MiteArrest weekly for 8 weeks

c. For Rats:
   i. Add 5 MiteArrest balls per rat to the cage.
   ii. Replace MiteArrest weekly for 8 weeks.

4. Topical Selamectin
   a. Two treatments with 10 days between each treatment
   b. For mice:
      i. 5 μl (10 mg/kg) of topical selamectin can be applied to the skin on the
dorsum between the scapulae.
   c. For rats:
      i. 20 μl of topical selamectin can be applied to the skin on the dorsum
between the scapulae.

VII. RETESTING OF TREATED COLONIES

A. Re-test all cages or a percentage of cages in the colony post-treatment at the
discretion of the veterinary resident and faculty veterinarian.

B. ULAM TST: collect the samples for retesting.

C. ULAM PCAR staff: assess the samples or submit the samples to the appropriate
diagnostic laboratory.

D. Fur plucks
   1. For procedure, reference “Surveillance of Rat and Mice Ectoparasites”.
   2. Follow-up fur plucks are most accurate when conducted 8 weeks post-
treatment.
      a. It is best to test mice 4-8 weeks of age or adult female mice during post-
treatment assessment.
   3. If adult mites are found, consult the faculty veterinarian to discuss additional
options such as colony rederivation or ivermectin treatment if an alternative
therapy was used initially.
   4. If eggs are found, the re-test colony using fur plucks in 4 months.
      a. Area husbandry supervisor: Tag egg-positive cages with a red Post-it tab
that includes the date of testing.

E. PCR testing
   1. For procedure, reference “Surveillance of Rat and Mice Ectoparasites”.


3. If positive post-treatment PCR results are reported, conduct fur pluck screening.

VIII. TREATMENT COSTS

A. ULAM will be responsible for fur mite treatment costs except in instances when the fur mites are attributable to animals that went through quarantine.

IX. RELATED DOCUMENTS

A. Rodent Outbreak Flowchart
B. “Surveillance of Rat and Mice Ectoparasites”
C. “Campus-wide Fur Mite Treatment Procedures”
D. CODA Worksheet
E. “Environmental Fur Mite Sampling & Testing Procedures”

X. PREVIOUS AUTHORS

A. Culmer/Cotroneo/Dysko