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University of Minnesota
Laboratory Animal Allergen (LAA) Exposure Control Program

PURPOSE

The goal of this program is to reduce or eliminate University employees’ and other community members’ exposure to allergens produced by rabbits or rodents throughout the University’s research and research-related settings. This goal is accomplished through a variety of protective measures including but not limited to PPE, ventilation, special work rules, medical screening, and employee training.

SCOPE AND APPLICATION

This program applies system-wide to all locations where activities involving rabbits or rodents occur for more than one hour per week. These include but are not limited to Research Animal Resources (RAR), Investigator-Managed Housing Areas (IMHAs), research laboratories and any other location or operation.

Table 1: Animal exposure risk bands

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Animal or Bedding Contact*</th>
<th>Near Animals or Bedding**</th>
</tr>
</thead>
</table>
| High       | > Frequent handling of animals without LEV  
            > Frequent handling or changing cages or bedding without LEV | > High density of animals |
| Moderate   | > Frequent handling of animals with LEV  
            > Frequent handling or changing cages or bedding with LEV  
            > Infrequent handling or changing cages or bedding without LEV | > Unventilated, open cages  
            > Wood-based bedding |
| Low        | > Infrequent handling of animals with LEV | > Filter top cages  
            > Positive pressure ventilated cages  
            > Absorbent bedding  
            > Non-contact bedding |
| Very Low   |                           | > Negative pressure ventilated cages |
RELATED

Lab Animal Allergen exposure is subsidiary to the topic of respiratory protection. Consult the University’s Respiratory Protection program for information on requirements for employee training, medical evaluations, fit testing, respirator selection, etc.

RESPONSIBILITIES

Office of Occupational Health and Safety (OHS)

1. Overall program management and oversight;
2. Developing training materials and providing training as resources allow;
3. Coordinating medical respirator fit testing;
4. Maintaining respirator medical recommendations and respirator fit testing documentation for each employee; and
5. Management and coordination of medical screening and surveillance.

Supervisors and/or Principal Investigators

1. Identifying personnel who are covered by this program and informing them of the requirements;
2. Ensuring that covered personnel are medically evaluated and fit tested as outlined in the Respiratory Protection program;
3. Providing personnel with respirators as needed during their work;
4. Ensuring that covered personnel receive training, as outlined in this program, and ensuring that training is properly documented; and
5. Enforcing all applicable safety measures related to this program.

Employees

1. Review the Lab Animal Protection program;
2. Complete required training;
3. Comply with all established work rules pertaining to the use of respiratory protection;

Department of Environmental Health and Safety (DEHS)

1. Provide assistance with training;
2. Identify areas where this program is applicable but has not been implemented;
3. Conduct exposure assessments on request by OHS or Departments; and
4. Promote overall compliance with exposure controls and other protective measures outlined in this program.

PROGRAM ELEMENTS

1. Occupational exposure guideline for laboratory rodent and rabbit allergens

1.1 General. The University of Minnesota Occupational Health and Safety Steering Committee has approved 5ng/m³ of mouse urinary proteins (MUP) as a 30 minute short term exposure guideline for the prevention of laboratory animal allergy.

2. Protective measures

2.1 Local Exhaust Ventilation (LEV). The University shall make every effort to provide adequate local exhaust ventilation for high exposure activities. All cage dumping operations shall have local exhaust ventilation. No cage dumping shall be performed without local exhaust ventilation.

2.2 Biosafety cabinets (BSCs). All horizontal or vertical hoods shall be replaced with Class II Biosafety Cabinets (BSC-II) in all rodent-handling facilities. The highest priority for BSC-II hoods shall be those spaces where cages do not have filter tops and where no hoods are currently in use. Personnel performing cage changing without a BSC-II hood shall be required to wear respiratory protection. The minimum level of respiratory protection shall be a filtering facepiece respirator with N95 filters.

2.3 Bedding. All areas shall use corncob (or similar) bedding rather than wood chips.

3. Respiratory Protection

3.1 General. Table 2 must be consulted to identify work activities for which respiratory protection is required or permitted. Personnel conducting activities with exposure levels greater than 5 ng/m³ MUP (30 min time-weighted average), as identified in table 2, shall be required to wear respiratory protection.
### Table 2: Job tasks with exposures greater than 5 ng/m³ MUP and required respirator type

<table>
<thead>
<tr>
<th>Job/Area/Task</th>
<th>Minimum type of respirator</th>
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</thead>
<tbody>
<tr>
<td>Cage dumping with local exhaust ventilation*</td>
<td>Half mask air purifying respirator with N95 filters**</td>
</tr>
<tr>
<td>Cage changing with local exhaust ventilation</td>
<td>Half mask air purifying respirator with N95 filters</td>
</tr>
<tr>
<td>Cage changing in laminar flow hood (not BS-C-II)</td>
<td>Half mask air purifying respirator with N95 filters</td>
</tr>
<tr>
<td>Working in areas with high density of animals and cages without filter tops</td>
<td>Half mask air purifying respirator with N95 filters</td>
</tr>
<tr>
<td>Performing lengthy experiments without local exhaust ventilation or in non-BS-C-II hood</td>
<td>Half mask air purifying respirator with N95 filters</td>
</tr>
</tbody>
</table>

*Cage dumping is not permitted without local exhaust ventilation.*  
** May use a hood or helmet PAPR if manufacturer has demonstrated a protection factor of at least 1000.

### 3.2 Specific types of required respirators.  
In cases where exposure is less than 10 times the exposure guideline, a filtering facepiece respirator (N95 filters) shall be provided (at a minimum). Where exposures exceed 10 times the exposure guideline, a respirator with higher protection (e.g. full facepiece or powered air purifying respirator) will be required.

### 3.3 Requirements for respirator users.  
Covered individuals must be medically evaluated prior to wearing a respirator. Follow-up medical evaluations may be necessary based on the judgment of a qualified medical provider, or when job duties or health status change. All medical evaluations must comply with the University’s Respiratory Protection program.

### 4. Occupational Health Screening

### 4.1 General.  
All personnel covered by this program must receive preliminary medical evaluation through the administration of the Animal Exposure Questionnaire (AEQ). Periodic re-evaluation may be necessary for personnel who are found to be at increased risk.

### 5. Training

### 5.1 General.  
All persons covered by this program must complete Lab Animal Allergen training. Those required, or permitted to wear respirators must also complete
respiratory protection training as outlined in the University Respiratory Protection program.

5.2 **Frequency.** Training shall occur prior to the initiation work covered by this program with annual refreshers. Refreshers may be a brief summary of the information covered in initial/new employee training.

5.3 **Content.** At a minimum, Lab Animal Allergen training must cover the hazards of exposure to Lab Animal Allergens, including signs and symptoms of exposure, the types of work creating a risk of exposure, protective measures, and how to report concerns. The content of respirator training is indicated in the University Respiratory Protection program.

5.5 **Documentation.** All safety training shall be appropriately documented. At a minimum, training documentation will include the time, date and length of training, a summary of the information presented, the name of the trainer, and name and job titles of those in attendance. Training records must be maintained by the employees’ department.
APPENDIX

The Animal Allergen Exposure Control Program at the University of Minnesota was developed to address employee exposures to animal allergens experienced during the care and use of laboratory animals during activities sponsored by the IACUC. Lab animal allergy (LAA) is an important occupational health and safety risk for laboratory animal researchers, particularly when working with rodents and furred animals. It is possible to lower the risk for LAA by decreasing the level and duration of exposures to sensitizing animals.

Initial Risk Assessment

Based on published reports, the University of Minnesota Office of Occupational Health and Safety (UOHS) determined that certain activities are associated with unacceptable risk of exposure to LAA (Table 2). This assessment indicated that the highest exposure levels are associated with activities involving management of used bedding and care of live animals (cage dumping, cage cleaning, animal feeding) when there are no controls present that limit the buildup or release of allergens to the environment (e.g. local exhaust ventilation, downdraft hoods, filter top cages, ventilated cages, appropriate bedding, etc.). A high density of animals in a space will also lead to higher levels of airborne allergens. Moderate levels will be associated with the same activities described above, but with controls to minimize buildup or release of allergens. Low exposure levels will occur during the experimental use of animals (technicians, students, investigators).

Engineering controls should be the primary method for lowering exposure to animal allergens. Cage dumping operations must be equipped with local exhaust ventilation. Cage changing operations should be conducted in a ventilation device designed to prevent personnel exposure to allergens (biosafety, backdraft or downdraft booths).

The best building or room design features include:

1. Non-recirculating, one-way airflow systems in animal handling rooms
2. Animal rooms at negative pressure compared to corridors

It is recognized that these features may not always be compatible with best practices for ensuring animal health.

The best design features for animal cages that will limit airborne emission of LAA include:

1. Ventilated or filter-top cages
2. Absorbent (best) or corncob bedding
3. Non-contact bedding

The best design features for controlling individuals’ exposures to LAA during experimental use activities are:

1. Biosafety cabinets; or
2. Ventilated workstations with down-draft or back-draft systems
Table 2 – Risk Levels Associated with Lab Animal Allergen Exposures

<table>
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<tr>
<th>Risk Level</th>
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<th>Near Animals or Bedding**</th>
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<td>High</td>
<td>&gt; Frequent handling of animals without LEV</td>
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</tr>
<tr>
<td></td>
<td>&gt; Frequent handling or changing cages or bedding without LEV</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>&gt; Frequent handling of animals with LEV</td>
<td>&gt; Unventilated, open cages</td>
</tr>
<tr>
<td></td>
<td>&gt; Frequent handling or changing cages or bedding with LEV</td>
<td>&gt; Wood-based bedding</td>
</tr>
<tr>
<td></td>
<td>&gt; Infrequent handling or changing cages or bedding without LEV</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>&gt; Infrequent handling of animals with LEV</td>
<td>&gt; Filter top cages</td>
</tr>
<tr>
<td></td>
<td>&gt; Positive pressure ventilated cages</td>
<td>&gt; Absorbent bedding</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>Very Low</td>
<td>&gt; Absorbent bedding</td>
<td>&gt; Negative pressure ventilated cages</td>
</tr>
</tbody>
</table>

* Frequent ≥ 1 hr/day; Infrequent < 1 hr/day

** Male rodents generally more allergenic than female

LEV = local exhaust ventilation (hoods or other devices to capture contaminant near its source). **Note**: **laminar flow work benches are not considered LEV**.

A variety of administrative controls can also be effective for lowering LAA exposures, including:

1. Restricting personnel access
2. Using female rodents instead of males
3. Rotating jobs to minimize exposure duration
4. Limiting wearing of street clothes during work and leaving work clothes at work
5. Practicing good personal hygiene (e.g. hand washing)

Personal protection may be necessary in addition to engineering and administrative controls, but should not be relied upon as the sole method for lowering exposures. Respiratory protection should be provided to those with significant risk of exposure. There are no specific OSHA regulations and no current regulatory or voluntary exposure guidelines for lab animal allergens. There is no standard method for measuring exposures. Specific protein allergens have been identified for most allergenic species and personal sampling methods are available for most of these. Measurements can be used to compare exposures in different locations and for different tasks. Measurements can also be used to assess the effectiveness of controls.

**Preliminary Recommendations and Actions**

In November 2007 UOHS concluded from a preliminary risk assessment that employees performing work that corresponds to the high and medium risk categories (Table 2) should be encouraged to wear respiratory protection. At a minimum, these employees would be encouraged to use filtering facepiece (N95) respirators. At the same time, the UOHS decided to conduct a more thorough assessment of
employee exposures and engineering and administrative control practices in animal research areas. A re-evaluation of the risk assessment was planned for mid-2008.

An interim program – Voluntary Use of Respiratory Protection for Exposure to Animal Allergens – was developed for employees and students involved in animal research activities in January 2008. This program included:

- Identifying all personnel in the high and moderate exposure categories (Table 1).
- Informing workers who are in the high and moderate exposure categories.
- Purchasing filtering facepiece respirators and making them available to any employee wishing to wear a respirator voluntarily to minimize exposures to LAA.
- Training all animal care personnel on exposures to lab animal allergens and respiratory protection.
- Encouraging employees to obtain medical evaluation and fit testing prior to wearing respirators.

All Research Animal Resources personnel whose jobs involved dumping soiled bedding from mouse and rat cages were required to enroll in the University of Minnesota Respirator Protection Program and required to wear filtering facepiece respirators with N95 filters (at a minimum).

**Determining an Exposure Limit**

There are currently no regulatory guidelines for exposure to lab animal allergens. Some universities (including Johns Hopkins) have adopted 5 ng/m$^3$ (mouse urinary proteins) as an internal exposure guideline. The University of Minnesota Research Occupational Health and Safety Coordinating Committee (ROHSC) conducted some informal benchmarking and recommended adopting this value, as well.

**Exposure Sampling**

**Cage Dumping**

RAR, Duluth: Airborne levels of mouse allergens during cage dumping were 10 times greater than the exposure guideline of 5 ng/m$^3$ (UMD Allergen Report, Sept 3, 2008, Environmental Health and Safety, Inc.). The operation uses a Biobubble, which provides some degree of local exhaust ventilation. RAR, Twin Cities (Molecular & Cellular Biology; Jackson Hall): Airborne levels of mouse allergens during cage dumping operations were 60 times greater than the exposure guideline of 5 ng/m$^3$ (U of M Allergen Report, April 8, 2008, Environmental Safety and Health, Inc.). No local exhaust ventilation was provided for cage dumping operations.

**Cage Changing**

Following a site visit in January 2008, AAALAC stated: "Changing cages is an activity that has the potential to create dust aerosols and subsequent exposure of personnel to allergens. Performing this procedure in a laminar flow cabinet may direct the aerosols toward personnel, potentially increasing their exposure." Laminar flow hoods are designed to protect animals from researcher-generated aerosols, but do not provide protection for researchers from animal-generated aerosols.

*Sampling conducted by UOHS and DEHS during cage changing operations corroborated this observation. Comparisons of levels among several types of hoods showed that only Biosafety Level 2 (BSL2) hoods were...*
capable of reducing personal exposures to acceptable levels (< 5 ng/m\(^3\)). Side-by-side comparisons of three types of hoods showed personal exposures to LAA were 4 times greater when using a horizontal flow hood compared to a type II BSC. Personal exposures using a laminar flow hood were 2 times greater than exposures using a type II BSC (U of M Allergen Hood Side-by-Side, July 2008, Environmental Health and Safety, Inc.).

Final Recommendations for Controlling Exposures

The Research Occupational Health and Safety Coordinating Committee recommended the following for minimizing employee exposures to lab animal allergens:

**Cage Dumping**

All cage dumping operations must have local exhaust ventilation. No cage dumping is permitted without local exhaust ventilation. All personnel are required to wear filtering facepiece respirators with N95 filters, at a minimum, when performing cage dumping tasks (with local exhaust ventilation). No respiratory protection will be required if sampling demonstrates that exposure levels are below the internal guideline of 5 ng/m\(^3\).

**Cage Changing**

All rodent areas should be using absorbent (corncob) bedding rather than wood chips. All horizontal or vertical hoods should be replaced with BSC-II in all animal-handling facilities. The highest priority for BSC-II should be those spaces where cages do not have filter tops and no hoods are currently in use. Eventually, all areas performing animal-handling operations should have access to BSC-II for employee protection. Personnel performing rodent cage changing operations without a BSC-II should be required to wear respiratory protection. The minimum level of respiratory protection should be a filtering facepiece respirator with N95 filters.