

AIR QUALITY:  
**DUST  
AND  
ALLERGENS**

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**Center/Location/Unit Name**

Center Director/Location Coordinator/Research Leader



## DUST AND ALLERGENS/AIR QUALITY

### *INTRODUCTION*

Exposure in the workplace to sources of allergens may result in occupational asthma, dermatosis, or other allergic reactions. Sources are wide ranging: certain chemicals and natural proteins are the culprits. People will respond differently to these allergens. Some will have an immediate reaction (asthma, dermatitis) upon the first exposure, others will develop an allergic reaction over time, and still others may continue to work with an allergenic source and never show any response.

Airborne dust is also a respiratory hazard. Organic dust accounts for most of the respiratory diseases seen in agricultural workers. Molds, pollens, and dusts generated in silos, barns, grain elevators, and other settings can contain 30-40% of particles in the respirable range. In enclosed settings (insectaries, confinement buildings, greenhouses), these organic dusts are particularly biologically active.

It is the policy of our location to anticipate, recognize, evaluate, and control those factors in the workplace that may cause sickness, impaired health and well-being, or significant discomfort to our employees. Appropriate actions will be taken to correct hazardous situations. Job hazard analyses will be performed to aid in developing engineering controls and administrative protocols, and selecting proper PPE (personal protective equipment). The benefits of the Occupational Medical Surveillance Program (OMSP) will be optimized, and compliance with appropriate health standards ensured.

### *BASIC PROGRAM*

**Hazard Assessment:** The recognition of existing and potential dust or allergen hazards is the first step towards improving health and safety in the workplace.

**Industrial Hygiene (IH) Survey:** A walk-through IH survey should obtain the following information: descriptions of the operations and work practices taking place; a list of biological hazards present (bacteria, viruses, fungi); a list of organic dust sources (animals, insects, pollen, grains, feed additives, soil grinding operations); a brief description of existing controls (fume hoods, respirators); and a written report documenting the survey. Please note: this plan is dealing only with dust and allergens; a full IH survey would include much more information (chemical hazards, physical hazards, etc.). See Appendix A for a sample IH survey and report.

**Evaluation:** Health hazard evaluations require the collection of qualitative and quantitative data. These data are used to assess the effectiveness of administrative controls, engineering design, and PPE.

*Workplace Monitoring:* Monitoring shall be conducted if a workplace assessment indicates a potential for overexposure to biological agents or air quality contaminants (dust). This plan will include the method of measurement, how many measurements will be taken and where, and how often measurements are needed. Appendix B lists some examples of determining the potential for overexposure to these air contaminants.

*OSHA 200 Log/OMSP:* The OSHA 200 log can help in identifying possible allergens. For example, an observation that employees carrying out one kind of work report a higher incidence of dermatitis than other employees at the location should trigger an investigation for the possible presence of a workplace allergen. Encourage your employees to report any type of allergic response (rash, nagging cough, shortness of breath) so the appropriate protections can be determined.

**Control:** When a physical or biological hazard cannot be eliminated from the workplace, worker exposure can be controlled through engineering design, administrative controls, or the use of PPE.

**Engineering design:** Implementation of engineering controls is the primary means of controlling worker exposure to the hazard. These include substitution of processes or material; local exhaust ventilation; and barriers or structures that separate or isolate the worker from the process.

**Administrative controls:** These may include limiting the length of time an operation is performed or rotating workers through the various tasks to limit the exposure to any one person.

**Personal protective equipment:** PPE is a secondary means to controlling exposure to a hazard and should be used only when the engineering controls will not sufficiently reduce or eliminate employee exposure, when the controls are technologically unfeasible, or before the controls have been installed.

NOTE: Control methods are listed in order of best practices, with engineering controls being the best.

**Training:** Proper training and education of employees is a requirement under most safety and industrial hygiene programs. Supervisors shall be knowledgeable regarding safety and health issues that may be found in their work areas or processes. Employees will receive safety and industrial hygiene training specific to the tasks they will be performing. Safety and health staff will be provided training, education, and resources in order to remain current with industrial hygiene policies and procedures. Subject specific training (such as SOP's for working with

insects, animals, grinders, etc.) will be given.

**Record Keeping:** OSHA requires that employers maintain accurate records of work-related deaths, injuries, and illnesses as well as records of sampling performed on employees exposed to potentially toxic materials or harmful agents, i.e., allergens and organic dusts.

**Program Relationships:** This program is closely related to several others. Among them are the Respiratory Protection, Biological Safety, Employee Animal Exposure Surveillance, Indoor Air Quality, Industrial Hygiene Survey, Personal Protective Equipment, and Occupational Medical Surveillance programs.

### ***IMPLEMENTATION***

Location safety officers, collateral duty safety officers, IH coordinators, CEPS (Cluster Environmental Protection Specialists), and ASHMs (Area Safety and Health Managers) will identify potential exposures to potentially harmful dusts and allergens by performing IH surveys at their respective locations. These surveys will identify the active or potential workplace health hazards that could require remediation efforts. Supervisors will be provided with the tools, training, checklists, information, and personnel to conduct health hazard assessments (see the NPA Safety Website for examples of hazard assessment/job safety analysis forms; <http://www.npa.ars.gov>).

Supervisors will ensure that a health hazard assessment of their work area has been made and is repeated if the nature of the work performed changes or when a new project is initiated. Supervisors are strongly encouraged to request the assistance and involvement of safety personnel in making health hazard assessments.

Because of the shortage of industrial hygienists within the area, ASHMs, CEPS, and Location or Collateral Duty Safety Officers must be used for program implementation. Qualified personnel will require sufficient training and ability to recognize and evaluate safety and health hazards plus additional training in conducting IH surveys. Survey equipment for such evaluations will be provided by the location or through equipment loans from the ASHM or other locations.

### ***REFERENCES***

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Sprince NL, Lewis MQ, Whitten PS, Reynolds SJ, and Zwerling C. 2000. Respiratory symptoms: Associations with pesticides, silos, and animal confinement in the Iowa Farm Family Health and Hazard Surveillance project. *American Journal of Industrial Medicine* 38:455-462.

Threshold Limit Values and Biological Exposure Indices (current edition) from ACGIH.

**APPENDIX A**  
**IH Survey-Dust & Allergens**

Building Name: Animal Treatment (Bldg 26) Room No.:

Completed by: Terrie Wierenga, CDSO Date: September 15, 1999

Employees in Area: Steve, Allen, Mark, Sally, Jane (or list by job description)

Activities/work practices in area	Duration	Biological Hazard	Organic Dust	Controls Present
Grinding poisonous plants	1 hr/week	endotoxins	plant dust selenium (locoweed)	half-mask respirator with HEPA filter; slot hood; vacuum collector system
Treating animals	1 hr/day	ticks, fleas bacteria	cattle, horses hay dust plant dust	vaccination program & pest control dust masks or respirator, depending on plant being used steam sprayer & hose
Weighing out ground plant	1 hr/day	endotoxins	plant dust	respirator w/ HEPA cartridges gloves lab coat or coveralls
Cleaning pens	3 hr/week	bacteria	dried urine & feces (large animals) straw or wood dust	dust mask/respirator
<b>Sources other than work practice</b>				
Mice	24/7	hantavirus fleas/plague	dried urine & feces	mouse traps & rodent bars
Outdoor air			pollen	herbicide spraying around building

**Additional Comments:** Area is in good shape; aisles, floors, and walls are clean. Weighing area: floor needs swept; slot hood is at 185 cfm (10/31/98). Employees have been trained & are using PPE correctly. 100% outside air. Natural gas heater; no a/c.

A full industrial hygiene survey would look at many more areas than those listed above. Lighting, noise, ergonomics, vibrations, chemicals, etc. would be covered. In this plan, we are concentrating only on dust and allergens in the workplace. Few regulations exist for dust levels in the workplace. OSHA currently lists just a few PELs (permissible exposure limits) for substances such as cotton dust and nuisance dust. Very little information is found on allergens.

How to start? First, look at your OSHA 200 log (where injuries and accidents are recorded). Are there reports of dermatitis or asthma episodes? Next, review the OMSP results. Are employees doing a specific type of work showing a decrease in lung function? Or is there a group of employees consistently reporting a rash or red, tender skin areas? These could indicate where you should investigate first.

Talk to the employees and supervisors. Encourage them to report anything resembling an allergic response—itchy or dry skin, hay fever symptoms, rashes, constricted or obstructed airways. Remember that people show a wide range of sensitivity to allergens. Some will never show a reaction while others will experience severe symptoms upon their first exposure. A good source of information on allergens is the book *Agricultural Health and Safety: Workplace, Environment, Sustainability* (published by CRC Press in 1994). NIOSH (National Institutes of Occupational Safety and Health) at <http://www.cdc.gov/niosh/homepage.html> has an agricultural safety program in addition to numerous electronic publications on all aspects of occupational safety and health.

When conducting the survey, look first at the whole room and note general conditions—is it dusty? cluttered? well-lit? clean? Do you see any PPE, and is it being used or stored correctly? What equipment is present? List when hoods were last certified and what their face velocities were. Are there signs of mold or bacterial growth (both experimental and naturally occurring)? Note the type of HVAC (heating, ventilation, air conditioning) system. Any indications that moisture is accumulating in the ducts? Next look at what procedures are being done in the room or area; talk with the employees to find out how often who does what, and what observations they may have made (“It’s really dusty when Joe uses the grinder, even when it’s under the snorkel hood”). Identify sources of organic dusts, allergens, and biological hazards. Keep in mind that not all will be generated by the work being done. Rodents, especially mice, are present in many outbuildings. They can be carriers of hantavirus and fleas carrying the plague bacterium. Pigeons or starlings roosting in rafters can carry viruses and bacteria that can be transmitted to humans. Pollen from the trees, bushes, shrubs, grasses, and flowers that are part of the landscaping can be a source of allergens in the workplace.

**Write up the results of your survey** and any additional comments you may have (employees were trained on hazards in their workplace and what PPE to use; supervisors have done hazard assessments; hoods and other equipment are operating properly; etc.). Identify areas of concern—lots of evidence of rodents despite rodent bars and traps; benches, floors, and light fixtures very dusty; even your own physiological reactions when you entered the place (eyes watered, sneezing). You need this information so you can decide what monitoring, if any, should be done (see Appendix B for help in determining the potential for overexposure to biological agents or dust).

## APPENDIX B

### Determining Potential for Overexposure and Developing a Monitoring Plan

You've completed the IH survey. Next is deciding what (if anything) you should be monitoring. This is where it gets difficult! Especially with allergens, people will show a wide range of susceptibility. As a general rule of thumb, high molecular weight molecules from plants and plant products, animals, and insects are the most sensitizing (greater chance of causing an allergic response in someone). Also, if someone is already allergic to a sensitizer such as cat hair, they have a greater chance of showing an allergic response when exposed to another sensitizer such as insect scales in an insectory or grass pollen in a greenhouse.

The American Conference of Governmental Industrial Hygienists (ACGIH) publishes a book containing TLVs and BEIs (threshold limit values and biological exposure indices). The values listed are for use by industrial hygienists as guidelines to assist in the control of workplace hazards; they are not regulatory values. That said, the booklet does offer a good summary on biologically derived airborne contaminants. In the 2000 publication, this section is found on pages 11-14 and gives an excellent overview of the monitoring process. Pages 96-103 summarize the BEIs and recommended sampling times.

Ideally at this stage, you will be working with an industrial hygienist to determine what types of monitoring need to be done. Within the Northern Plains Area, Bonnie King (ASHM, Ft. Collins, CO) and Alvin Harding (IH, Lincoln, NE) have been trained as part of the REEIH PAC (Research, Economics, and Education Industrial Hygiene Program Advisory Committee). Other location safety officers may be able to assist you. If your location is co-located on a university, the industrial hygienist there may be able to help in developing a monitoring plan.

#### *Sample Monitoring Plan*

#### **Monitoring Plan for Grinding Plants**

Several hundred pounds of plant material are ground for use in solvent/base extractions prior to further chemical analysis. Fine particles are generated. Air sampling will be performed before, during, and at the end of the grinding (when the employees are cleaning out the grinder).

Equipment: Gehl hammer mill rotating grinder/mixer.

Plant: locoweed (*Astragalus lentiginosus*)

Location: outside of Bldg 30 (PPRL shop)

Particulates in air, 10 and 2.5  $\mu\text{m}$

Sample Time	Conditions	2.5 $\mu\text{m}$	10 $\mu\text{m}$
7:30 am, July 8	calm; last grind was Friday, July 5		
9:00 am, July 8	calm; 300 lb plant ground & mixed		
10:30 am, July 8	calm; grinder clean-out; ground 500 lb		