



## The Agricultural Health and Safety Network

Our mission is to improve health and safety on the farm through education, service and evaluation research.

The ultimate goal is to reduce injury and illness related to the farm environment through co-operative efforts with our partners.



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# Fact Sheet #5

## Minimizing Potential Human Health Risks Involved in Hog Farming

### DEFINING THE PROBLEM

The majority of swine confinement buildings are fully enclosed but without control (other than ventilation) technology to reduce or regulate airborne dusts, gases and microorganisms. In winter the barn's comfortable temperature is maintained by reducing ventilation and the intake of exterior cold air. This increases the levels of respirable indoor environmental contamination (dust, swine dander, fungi, bacteria, and gases).

### DUSTS

Dust in swine barns is composed of feed components (starch granules and grain meal), dried faecal material (undigested feed, gut epithelial cells and bacteria), hog dander (hair and skin cells), molds, pollen, grains, insects parts and mineral ash.

During normal breathing, large particles are trapped in the nose and in mucus in the upper respiratory tract. The mucus is continually swept upward by the movement of tiny ciliary hairs in the bronchial tubes, to be eventually coughed up, spit up or swallowed.

Smaller particles tend to stay in a stream of moving air, including the air inhaled deep into the lung. Once they have reached deep in the lung, these particles can lead to short and long term health effects.

### ENDOTOXINS

The cell walls of gram-negative bacteria contain endotoxin, a toxin capable of eliciting any of several general symptoms in producers exposed to occasional high dust concentrations or frequent, prolonged lower concentrations.

### GASES

#### Ammonia

- Ammonia is released by bacterial action on urine and faeces found on floors and in manure pits. Because of ammonia's affinity for water, it affects the moist surfaces it contacts causing irritation of the eyes, nose and throat.

#### Hydrogen sulfide

- Hydrogen sulfide is produced by bacteria in manure pits. When manure is agitated before or during pumping, hydrogen sulfide gas is rapidly released from the manure and can reach life-threatening levels within minutes. At low levels, the gas has a rotten egg smell. At high levels, the gas deadens the sense of smell, so there is no warning of dangerous conditions. Exposure to the gas can irritate the eyes, nose and throat. At higher levels, the gas can cause nausea, dizziness and unconsciousness. At a level easily reached during pit-pumping operations:

***The nervous system becomes paralysed, breathing is arrested, and in extreme cases death results.***

#### Methane

- Methane is also produced through anaerobic digestion of manure. There is some potential for pockets of methane to develop, but levels that could cause explosions or asphyxiation are extremely rare under normal conditions.

#### Carbon Dioxide

### Did you know?

A 20 minute nap is a treat for your body.

- The major source of carbon dioxide in a building is produced by animal respiration. Problems arise when ventilation or power fails and levels build over several hours as oxygen is depleted.

### Carbon Monoxide

- Carbon monoxide is produced by unvented gas heaters. Warning signs of exposure are fatigue, headaches, possible nausea and impaired mental ability. Pregnant women working in farrowing or nursery buildings should be aware of the potential health hazard of carbon monoxide exposures to a developing fetus.

## ENVIRONMENTAL CONTROL

- First, control the pollutants at the source. Eliminate the dust and gases before they get into the air.
  - Second, eliminate the pollutants once they are in the air, before they are inhaled by people or pigs.
  - Finally, control can be accomplished at the individual level, using dust masks and respirators.
  - Manure pH should be kept around 7-8.
  - Manure should not sit in the pit for more than 3 weeks.
  - In barns with deep pits under slatted floors, the danger of toxic gas accumulation is very high if manure is left for more than 3 weeks.
  - Under no circumstances should the building be entered during agitation.
  - Never enter manure pits under any circumstances. The only respirator that can protect you from hydrogen sulfide is one with its own air supply.
    - disposable,
    - quarter-mask,
    - half mask,
    - full face-mask and
    - helmet.
  - How Big is the Problem?
    - The range of particle sizes may result in various portions of the respiratory tract being affected.
    - The most common symptoms experienced by confinement workers are dust related: cough, phlegm production, chest tightness, shortness of breath and wheezing.
    - Symptoms may occur early in a producer's career or long-term health effects may develop.
    - Long-term exposure to moderate dust levels in confinement buildings can result in chronic respiratory conditions.

## CLEANING

A simple and economical means of controlling dust is to regularly power wash each room in the barn which removes dust from ceilings, walls, rafters, floors and any other surfaces. Farrowing rooms should be completely washed before each new group of sows. Nurseries and grower units should be washed every 1-2 months. Finishing buildings should be washed at least every two months. At the very least, each room should be washed whenever emptied. Cold water is just as effective as hot water, costs less and prevents steam from enveloping the room. Clean ceramic space heater cores to minimize carbon monoxide output.

## VEGETABLE OIL DUST CONTROL METHOD

Sprinkling of crude canola oil has been shown to not only reduce dust levels but also to reduce hydrogen sulfide and ammonia concentrations. The application should cover the entire floor, pigs, and operator walkways.

## FEED ADDITIVES

University of Illinois studies have shown that the feed additive sarsaponin has positive effects in reducing the ammonia released from decomposing manure.

The addition of canola oil, fat and lecithin to rations has been useful in reducing airborne dust. These additives cause small particles to agglomerate and remain with the feed rather than becoming airborne as dust.

## FEED DELIVERY

Automated feed delivery is preferred, but long feed drops should be enclosed. If manual feeding is used, a dust mask should be worn because manual feeding results in the highest personal exposures. Feeding should ideally be done just before leaving the room or building to limit human exposure.

## CLEAN ANIMALS

Livestock that are clean and mange-free will contribute less to total dust levels than dirty animals. Using an oil spray (e.g. mineral oil) helps control hog dander.

## WASTE HANDLING

In shallow pits with scrapers or pull plugs, adding a thin layer of water after scraping or draining will help keep ammonia in solution rather than in a gaseous state. Frequent flushing of gutter systems with clean water, instead of recycled water, will have the same effect.

Low-residue flooring, such as wire mesh or narrow slats, keeps urine and faeces from accumulating resulting in less ammonia evaporation and pulverization of feed and faecal material than solid flooring.

Avoid air movement through manure channels from one room to another or from manure pits back into the barn. This air movement will carry manure gases into the room. Use water traps or removal plugs.

Before starting to agitate manure in pits, open windows and doors and turn fans on high. Agitate manure very slowly at first, increasing speed gradually. Use as little agitation as possible. Stop agitation and pumping if animals are in distress.

## VENTILATION

Increasing the ventilation rate will most likely improve the air quality. In winter, it may be desirable to increase ventilation rates even though the temperature may be lower. This will prevent high levels of gas from collecting. Increasing ventilation rates increases the demand for supplemental heat and this is expensive. Therefore, every attempt should be made to reduce gas production by good manure management.

## HEATERS

Gas or Lp burning heaters should be inspected yearly and cleaned to prevent inefficient burning of fuel, which results in production of excess carbon monoxide.

## TYPES OF RESPIRATORS

There are two broad types: air-supplying and air purifying

Air-supplying respirators are self-contained while air-purifying respirators are used with a filter for dust, fumes and mists.

In addition to these two types, respirators can also be categorized as:

Most people who start wearing a respirator soon find that they are more comfortable in the barn.

The fit is the most important element in achieving protection. If the mask leaks around the face-to-mask seal, contaminated air will be inhaled.

Not everyone can wear a respirator safely. Health problems that can complicate respirator use include lung disease, heart disease, anaemia or a similar condition. Breathing resistance is minimized when a powered air-purifying respirator is used.

## WHEN TO WEAR A RESPIRATOR

During any job that has caused respiratory symptoms in the past, especially dusty jobs such as handling, moving or feeding animals.

Whenever dust concentrations exceed the recommended maximum level for human health determined only by measuring.

## POTENTIAL HUMAN HEALTH RISKS

The severity of symptoms workers experience largely depends on the time spent in the barn, the concentration of respirable contaminants, the usage of personal protection equipment and the worker's susceptibility. The more time a swine producer spends in a swine confinement building the more likely that operator is to experience symptoms such as irritation of the eyes, nose and throat, coughing and mucus buildup.

## HUMAN HEALTH EFFECTS OF DUST

- The range of particle sizes may result in various portions of the respiratory tract being affected.
- The most common symptoms experienced by confinement workers are dust related: cough, phlegm production, chest tightness, shortness of breath and wheezing.
- Symptoms may occur early in a producer's career or long-term health effects may develop.
- Long-term exposure to moderate dust levels in confinement buildings can result in chronic respiratory conditions.

## HEALTH DISORDERS

**Bronchitis** is associated with excessive coughing and phlegm production. Cells lining the airways produce excess mucus to trap the irritating dust. The symptoms usually occur in those working in dusty buildings and are aggravated by smoking.

**Airways obstruction** is partially the result of narrowing of the airways and hypersecretion of mucus. The amount of air flowing into and out of the lungs can be reduced and breathing may become more difficult. It is associated with increased airways reactivity.

**Increased airways reactivity** can lead to bronchial constriction, chest tightness and shortness of breath.

**Occupational asthma** is a special type of allergic response that develops in susceptible individuals. The airways become narrow and wheezing may be heard. Mucus is produced. The constriction causes a tight feeling in the chest.

**Organic dust toxic syndrome** results from exposures to particularly high dust and endotoxin levels. Often this occurs after moving or sorting hogs or cleaning a confinement building or grain bin. Symptoms include fever, muscle aches, chest tightness, headache, cough and fatigue. Full recovery may take three or more days. It is often mistaken for the flu.

**Allergies** are caused by sensitization of the body to protein-containing components in the dust, such as molds, hog dander or feed dust components. Allergies to one or more of the molds found in confinement buildings are common among producers.

*If you are experiencing any of the above symptoms, it is advisable to see your doctor.*

## **CIGARETTE SMOKING AND DUSTY OCCUPATIONS**

The old familiar refrain:

*If you don't smoke, don't start, and if you do, quit! . . . is doubly appropriate.*

A multiplier effect on adverse health risks between occupational exposure and cigarette smoking has been found for other dusty occupations.

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**Reference list available upon request.**

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