

## Air Quality In Confinement Buildings

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are increasingly concerned about the occurrence of chronic lung disease in humans associated with confinement farming.

To Kephart the problem hits close to home. Although he enjoyed working with the animals in the 500-sow Adams County farrow-to-finish operation where he worked in the mid-70s, he found that his lungs didn't share his enthusiasm. Allergic to grass pollen, Ken found himself coughing and spitting phlegm from the lung irritation resulting from spending 75 percent of his time inside hog housing.

"I actually looked forward to going outside and shoveling manure by hand just so I could get out," Kephart recalls. "I always wondered what the inside of my lungs looked like."

This extension specialist isn't the only one wondering.

Iowa University researchers explored the problem by exposing rabbits and guinea pigs to a swine confinement environment 24 hours a day for 12 months. "The changes seen in these test animals enhanced the supposition that long-term occupational exposure to the atmosphere in swine confinement buildings could lead to chronic or permanent pulmonary disease in persons," the researchers reported.

According to this same report,

published in a 1984 edition of the American Journal of Veterinary Research, a variety of respiratory problems are common to the half million people who work in swine confinement buildings. Bronchitis afflicts nearly 70 percent of this group, with 12 percent reporting problems with asthma.

A number of gases have been reported at potentially harmful levels in swine buildings, including ammonia and hydrogen sulfide.

According to Penn State extension agricultural engineer, Dan Meyer, though, the most pervasive of all confinement unit pollutants is probably dust. In a study funded by the Pennsylvania Pork Producers Council, Meyer explored the dust problem in eight large commercial swine operations last year. The specialist divides dust into two types, based on particle size: those particles five microns or smaller, capable of making their way into the lungs, are termed respirable dust. Total dust includes all particles up to 10 microns. Many of these larger particles are filtered out in the nose and esophagus before reaching the lungs.

In the study Meyer enlisted the aid of technicians from Penn State's Center for Air Environment Studies to measure dust levels. Dust concentrations ranged from .6 milligrams per cubic meter to 5.1 for total dust, and .2 to

1.4 mg/cu. meter for respirable dust. According to Meyer, the University of Iowa recommends that total dust levels not exceed 2.5 and respirable dust levels remain at or below .2 to prevent long-term health problems.

"Even the good systems (in the Penn State study) were still too high in respirable dust levels, if these figures are accurate," Meyer points out. He also stresses that high-speed recirculation ventilation systems had much higher respirable dust levels than conventional systems. Total dust levels for both types of systems were about the same.

In the typical hog finishing unit, dust is usually composed of about 50 percent feed, with the balance made up of dried manure, molds, proteins and dead skin cells. Bacteria and viruses also hitch a ride on these particles, says Meyer.

The problem with this suspended brew is that most of it isn't visible, so victims often fail to make the connection between the dust and the coughing and spitting that it triggers. Then too, those who experience day-to-day exposure tend to become desensitized to the pollutants. One tip-off to potential problems, says Meyer, is the infrequent visitor who enters a unit and comes out coughing.

For farmers whose motto is "seeing is believing," Meyer recommends placing a furnace

filter in front of one of the building's recirculating or exhaust fans, then examining the dust accumulation.

By contrast, it's easier to pin a value on the amount of ammonia pollution present. The product of decomposing manure, ammonia is a common by-product in hog, poultry and veal operations, or anywhere manure is handled or stored.

Typical ammonia levels in Meyer's study ranged from zero to 107 parts per million, with 50 to 60 ppm being the level at which the eyes start to burn. "It's nothing to find 50 to 70 parts per million, (in swine buildings) especially in winter," says Meyer.

Meyer recommends that ammonia levels not exceed 25 ppm in environments where producers are exposed for eight hours. When concentrations rise to 35 ppm the safe exposure time drops to one hour. A syringe-type collecting instrument utilizing a color metric evaluation system similar to litmus paper pH testing is available to farmers interested in monitoring ammonia levels in their units. Meyer says the test unit sells for about \$125, and each test costs \$2.

Extension poultry specialist Forest Muir rates manure gases, particularly ammonia, as the most important pollutants in poultry operations. He also points out that

hydrogen sulfide can be dangerous when liquid manure is agitated in an enclosed environment. Since many producers are using fumigation to disinfect houses between flocks, Muir cautions that formaldehyde is another potentially hazardous gas that should be added to the list.

Poultry dust, composed of dry manure, feed dust and feather and skin dust, is also a potential health hazard, he says. Muir rates the broiler house dust situation more serious since a producer tends to spend more time with broilers on a daily basis than he would with an equal number of layers. Also, broiler houses are commonly cleaned about every eight weeks, increasing the amount of exposure time.

Muir emphasizes that proper building ventilation is essential to air quality. During the summer months an evaporative cooling system, utilizing high-pressure spray units at air inlets, will precipitate much of the dust from the air inside the building.

Ken Kephart points out that fecal dust in hog units can be kept to a minimum by keeping hogs on slats and flushing frequently.

Another effective way to reduce dust is to add five percent tallow to the finishing ration, he says. Although the addition of fat should result in some improvement in average daily gain and feed conversion, Kephart cautions that adding fat strictly to improve performance isn't normally economically feasible. "But there isn't any question that you can reduce the amount of dust by adding fat," he says, adding that research suggests that the cleaner air may reduce the severity of lung lesions in swine, as well.

One economical way to reduce dust levels significantly, says the extension specialist, is to install extended spouts on feed delivery

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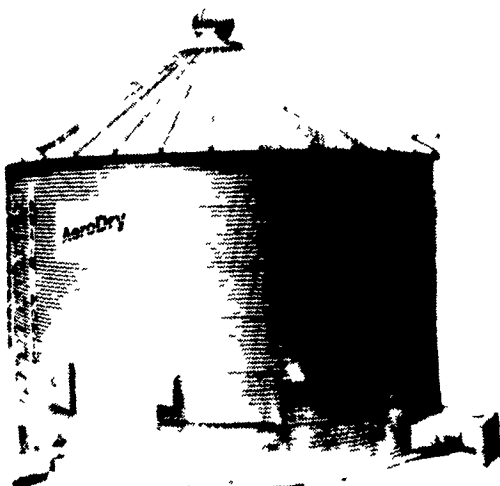
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