Pork Prose

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AIR QUALITY AND RESPIRATORY HEALTH

Respiratory diseases cost the swine industry a lot of money — something like $200 million a year, or about $2.50 for every hog we produce.

Few herds are spared from these economic losses, although some producers are fortunate enough to keep problems to a minimum.

What's the cause of these diseases? Clearly, pathogens such as Mycoplasma, Bordetella, Pasteurella, and Actinobacillus (Haemophilus) play a major role. But just as important is the quality of air that the pig has to breathe.

Let's take a brief look at how air quality affects hog performance.

Seasonal Variation

Pigs born in the winter months spend their early life in buildings under minimum ventilation. That's because we exchange the air very slowly to save on heating costs during cold weather.

Coincidentally, atrophic rhinitis (Bordetella and Pasteurella) gets its start during the early weeks of life. So it comes as no surprise that snout scores (which measure the damage from rhinitis) in a market hog are worse during the summer, since these pigs were farrowed in the winter.

Pneumonia is the opposite. Lung problems seem to arise if the pig spends his grow-out period in areas where air quality is poor. So pneumonia lesions tend to be worse in pigs that go to market in the winter.

Facility Variation

Studies show that both snout and pneumonia scores tend to be worse when hogs are raised in confinement, compared to outside. So the challenge is to keep the air as clean as we practically can, and at the same time keep the pigs warm and comfortable.

Meeting all of those goals, especially during the winter, is easier said than done.

Dust

Particles floating in the air that are less than 100 microns in diameter are generally considered dust. (If you piled up 65 of these 100-micron sized particles, they would make a stack about a quarter of an inch high.)

Dust less than 5 microns in diameter is called respirable, because it's too small to be filtered out before it reaches the lungs.

And dust in the lungs is bad for a lot of reasons. It contains irritating gases as well as high bacterial and fungal (mold) counts. Dust also has a high protein concentration which often creates an allergic reaction. And endotoxins released by the bacteria growing on the dust may affect growth.

How much dust does a typical hog barn have? Well, there may be 1-2 million particles (one-half micron and larger) floating in every cubic foot of air. But all the particles in a 20-crate farrowing room taken together would weigh less than a gram.

As any swine producer is aware, dust affects people. A survey by Kelly Donham shows that about 2/3 of all swine confinement workers complain of dust-related symptoms (cough, phlegm, scratchy throat, etc.).

Few studies have actually measured the effects of dust on hogs. The library is full of reports that tell us what air is like in a hog barn. And many articles even suggest that pneumonia and mortality is reduced in hogs coming from facilities with minimal dust concentrations.

That's helpful, but it's not the same as a controlled experiment in which pigs are subjected to precise and measured amounts of dust.

One such study conducted by Stan Curtis showed that dust decreased growth rate, but *only* when the concentration was about 200 times higher than normal and *only* when it was combined with 50 parts per million (ppm) of ammonia. Other researchers using a filtration system were able to reduce dust levels by more than half, but found that it had no effect on average daily gain.

So dust is bad stuff. But it appears to be a lot harder on us than it does on the hogs.

Ammonia

Typical ammonia levels in swine facilities range from 10 ppm to 35 ppm. Studies show that at 50 ppm, the pig loses his ability to clear harmful bacteria from the respiratory system. At 100 ppm, the lining of the airways is damaged. When the level exceeds 100 ppm, hogs sneeze a lot, and lose their appetite.

Carbon Dioxide

At 40,000 ppm of carbon dioxide, respiration rate increases. But the concentration would never reach this level in a hog barn. If it did, there would probably be 100 other things to worry about before you would think of carbon dioxide.

Carbon Monoxide

Carbon monoxide is produced by incomplete combustion, which occurs in hog facilities only when fuel-burning heaters in a room are malfunctioning or dirty. Levels of 200 ppm may cause baby pigs to be sluggish, or in some cases lead to stillborns.

Hydrogen Sulfide

This gas, which is incredibly lethal, originates in the manure pit. The good news is that it will generally stay dissolved in the manure unless agitated. So at the very least, *anytime* you agitate a manure pit under a barn, crank up the fans to their maximum. Better yet, do the agitation when pigs, and especially people, are not in the building.

Twenty ppm of hydrogen sulfide is enough to cause pigs to stop eating and be fearful of bright light. Levels of 800 ppm are deadly.

Effective Air Temperature

Although air temperature is different from air quality, the two are closely related. Your attempts to maintain warm temperatures in a nursery during winter often results in poor air quality.

If you increase ventilation rate, air quality improves, but air temperature goes down. Worse yet, as temperature drops, the chances for a draft go up.

An air speed of only .65 foot/second at floor level will make the pig feel like the temperature is 7 degrees less than what the thermometer reads. Increase the speed to 5 foot/second and this "effective" air temperature drops another 11 degrees.

Flooring also plays a role. Straw will make the pig feel about 7 degrees warmer than the actual temperature. Wet concrete may make the pig feel 18 degrees colder.

Wall temperature also changes the comfort of the pig. If the wall is five degrees colder than the room, a pig in the center of the room will feel like it's three degrees colder. If the wall is 23 degrees colder than the room, then the effective air temperature will drop by almost 13 degrees — something to keep in mind the next time you think you're saving money by skimping on the insulation.

Penn State Air Quality Studies

We've completed three winter trials in a grower-finisher house to compare hog performance under two environments. We divided a conventional finishing house (mono-slope, curtain sided) into two rooms. The standard room used a thermostat to raise and lower the ventilation curtain. In the

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