

# **Respiratory Disorders of Hog-Confinement Workers**

(What are the Human Health Effects of Working in or Living Near Large-Scale Hog Confinement Facilities?)

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## **Introduction**

There is growing concern about the impact on human health of living near large-scale hog confinement facilities. This matter has received a great deal of attention in recent years as the number of hogs raised in such buildings has increased and as the public has become more concerned about environmental issues in general. Whether or not large-scale hog farming is good for the economy has become a subject of heated debate in which economic and social as well as medical questions are raised. As this complex topic is discussed, care must be taken to avoid confusing the neighborhood health concerns with work-related health problems seen in hog confinement workers. There is much more information published about problems caused by working inside hog confinement facilities. Even though the characteristic hog odor is quite apparent in the neighborhood as well as in the barns, one cannot assume that the neighborhood exposure is sufficient to cause the same health problems that the workers experience from breathing the air inside the buildings.

## **The effects of working in the hog confinement barn**

The effects of working in the hog confinement barn have been studied extensively by investigators in Canada, the US and in Europe. It has been known for some time that working in hog confinement facilities causes chronic or intermittent respiratory symptoms in approximately 1/3 of workers. These respiratory symptoms consist of cough (which may or may not be productive of phlegm), chest tightness, wheezing and shortness of breath with heavy exertion. Depending on the group of symptoms displayed, the subject may have chronic bronchitis, an asthma-like syndrome, or exacerbation of pre-existing asthma. Very rarely, a true allergy to hogs develops that is associated with allergic asthma. The respiratory impairment associated with this work is usually not severe. However, even a small to moderate decrease in lung function can be problematic in workers who perform heavy physical labor. Hog confinement workers who smoke cigarettes are at risk for developing severe, disabling chronic lung disease. Cigarettes alone cause significant chronic respiratory disease (chronic bronchitis and emphysema) in about 20% of smokers. The negative effects of cigarette smoke and work in the hog barn environment are additive.

Nasal symptoms develop in some workers as well. Various investigators have reported that anywhere from 8% to 74% of workers develop nasal stuffiness and other nasal symptoms. Loss of sense of smell or other evidence of impairment in nasal function has not been identified. Some workers also develop burning of the eyes and a sore throat. Together, these symptoms are known as the mucous membrane irritation syndrome.

All of the respiratory symptoms described above are related to levels of dust and ammonia in the air of the barns. Hog dust contains large amounts of endotoxin, a highly inflammatory substance that comes from the cell walls of Gram negative bacteria. These bacteria are quite abundant in this environment because they are found in manure. Ammonia is derived from hog urine. It

appears that dust, ammonia and endotoxin act together to cause the disorders described above. Concern has been raised recently in Nebraska about the role of hydrogen sulfide, a malodorous gas that comes from hog confinement manure storage facilities as well as from a number of other sources. Recently, scientists found an association between asthma exacerbations and high hydrogen sulfide levels in the air in a northeast Nebraska community where there is a large beef processing plant. This plant stores wastewater in holding ponds, where the organic matter within the water degrades to form hydrogen sulfide. Hydrogen sulfide can also be measured in outdoor air on hog farms. However, studies have not yet been published concerning asthma attacks and hydrogen sulfide levels in persons working in or residing near hog confinement facilities.

A number of other health problems are associated with work in hog confinement barns. Some workers develop a flu-like illness called organic dust toxic syndrome from unusually heavy exposure to dust in their work. Symptoms of organic dust toxic syndrome include fever, chills, headache, muscle aches, malaise, fatigue and dry cough. This illness lasts for several days and is not life threatening. There is some evidence that having had organic dust toxic syndrome makes people more sensitive to having respiratory symptoms such as cough and chest tightness with subsequent exposures to organic dust, such as grain dust or hog dust. Hydrogen sulfide is a gas that has the odor of rotten eggs that is present in low amounts in the hog barns. When levels of hydrogen sulfide rise to very high levels secondary to agitation of a manure pit under the floor of the barn, inhalation of this gas can be fatal to workers. Inhalation of low amounts of hydrogen sulfide by workers has not been shown to be associated with respiratory disorders. Other health problems associated with working in hog confinement barns include traumatic injury, such as bruises, animal bites and needle-sticks. Back injuries and other musculoskeletal disorders related to heavy lifting and repetitive motion are common. Work-related hearing loss has been reported in this setting. Rarely, serious infectious diseases such as meningitis and hepatitis can occur.

Our understanding of how many persons living near hog confinement operations consider their health to be negatively impacted is still quite limited. There is an urgent need to document health problems in large samples of hog confinement facility neighbors and to make careful comparisons with rural residents who do not live near such facilities. Such research projects should use objective measures of health as well as subjective information obtained by asking persons about symptoms of illness. Efforts should be made to compare the prevalence of symptoms and signs of human illness with air quality measurements made in the neighborhood. Until this research has been done, we will not have a true understanding of the human health implications of constructing more hog confinement facilities. Also, we will not know how to monitor existing hog farms in interest of assessing their potential for causing human illness in the neighborhood.

## **Studies**

A small number of studies have been published that consider the human health effects of living near large hog confinement facilities. These papers include an article written by Thu, Donham and colleagues at the University of Iowa. Their article describes data obtained from 18 persons living within a two-mile radius of a 4,000-sow confinement facility. Data collected consisted of self-reported symptom histories. Their findings included seeing several clusters of symptoms more commonly in the confinement facility neighbors than in rural residents who do not live near hog confinement facilities. The authors divided the symptoms into clusters. Cluster 1 symptoms included sputum, cough, shortness of breath, chest tightness and wheezing. Cluster 2 complaints were nausea, dizziness, weakness and fainting. Cluster 3 consisted of headaches and plugged ears. Cluster 4 included runny nose, scratchy throat and burning eyes. Cluster 5 symptoms were muscle aches, hearing problems, skin rash and fever. Cluster 1, 2 and 3 symptoms were

statistically more common in hog facility neighbors than in control subjects. A medical assessment was not done to look for objective measures of ill health in either population. Questionnaires were done to look for evidence of depression and anxiety. Both the hog confinement neighbor and comparison populations scored in the normal range on the depression and anxiety surveys.

Schiffman and colleagues studied 44 neighbors of large-scale hog operations in North Carolina using a psychological testing tool called the Profile of Mood States and compared their results to a group of people who did not live near confinement facilities. Persons living near the swine operations reported more tension, depression, and anger in this study. They had less vigor, more fatigue and more confusion than control subjects enrolled in this study. The authors concluded that these differences could be explained by neighborhood exposure to hog odors.

Wing and Wolf recently surveyed several rural communities, one of which was near a 6,000-head hog operation and two of which were near large cattle operations. Another community studied was near no large livestock farms. The 155 participants were not told that the reason for the survey was concern over the health effects of living near large-scale livestock facilities. Findings included increased occurrence of headaches, runny noses, sore throats, excessive coughing, fatigue, diarrhea and burning eyes near the hog operation. Quality of life, as measured by the number of days residents could not open their windows or go outside in nice weather, was greatly reduced in those who lived near a hog operation compared to both of the other groups. As with the other studies, no physical assessments of the subjects were done.

In summary, hog confinement workers clearly are at risk of developing chronic or intermittent respiratory disorders. While these disorders are not life-threatening, they can interfere with their ability to perform their work and may be reason for workers to leave the industry. The substances that cause these problems include hog dust, endotoxin and ammonia. Hydrogen sulfide, while quite malodorous, has not been associated with the presence of chronic respiratory disease in workers although it can cause fatal lung injury if it is present at very high levels.

### **Living in the neighbourhood of large-scale hog facilities**

There is evidence from a small number of published research studies that people living in the neighborhood of large-scale hog facilities are more likely to have a variety of medical complaints. These complaints range from respiratory problems to burning eyes, sore throats, nausea and diarrhea, fatigue, headaches and plugged ears. Some but not all of these symptoms are like those of the hog confinement workers, who receive a much more intense exposure to the dust and odors associated with this industry. At this time, there are no published studies in which scientists have attempted to find physical evidence of negative health effects in neighbors of hog facilities. Psychological symptoms, including tension, depression and anger were more common in hog facility neighbors studied by the group of researchers that looked at psychological aspects of the neighborhood health issue. Quality of life does appear to be affected by the presence of the unpleasant odors associated with this industry. Thus, evidence is stronger that there are negative effects on emotions and on one's ability to enjoy life secondary to residing near large hog farms.

### **Summary**

These studies represent a very important step in addressing the neighborhood health effects aspect of the large-scale hog confinement facility debate. However, much more work remains to be done before there is enough data about the human health neighborhood effect of large-scale hog facilities in order to draw firm conclusions that could have a permanent impact on the industry.

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