

Below you will see an excerpt from a study that states that dust created by Animal Containment Facilities have the potential to create or increase respiratory problems in the surrounding rural environment.

Inhalable and Respirable Dust, Bacteria and Endotoxins in the Air of Poultry Houses

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Abstract

The air in livestock buildings contains a large variety of different gases, micro-organisms and considerable amounts of dust. These particles have a complex nature, can carry substances such as endotoxins and antibiotic residues, can remain suspended in the air for longer periods because of their minute dimensions and can therefore be inhaled by animal and man. Strong epidemiological evidence suggests that dust associated with bacteria can cause directly infectious and allergic diseases in animals and farm workers. Major quantities of these compounds are emitted in the environment where the health of nearby residents may be harmed by regular exposure and where the small particulates may contribute to atmospheric pollution and global dimming. However, our knowledge is still poor about the concentration of dust in different animal housing systems. This paper summarises some quantitative data from a recent study on occurrence of dust, micro-organisms and endotoxins in different keeping systems for laying hens and for broilers, turkeys and ducks. Highest inhalable dust concentrations (up to 10 mg/m³) were found in the air of broiler houses at the end of the 4th fattening week which is 2.5-times higher than the German occupational health threshold for workers (4 mg/m³); airborne total bacteria (predominantly *Staphylococcae*) count was up to 140 x 10⁶ cfu/m³ in winter. Fungi vary considerably in concentration and can reach nearly 300,000 cfu/m³ in the turkey barn. Highest endotoxin concentrations (14,000 EU/m³) were found in the inhalable dust of the broiler barn in winter. Inhalable dust concentrations between 1.3 and 9.5 mg/m³ were found in the air of the aviary, 0.2-2.3 mg/m³ in conventional cages and 0.4-3.5 mg/m³ in the furnished cage system with respective respirable dust concentrations of 0.2-4.4, 0.01-1.30 and 0.1-0.99 mg/m³. The airborne bacterial counts ranged from 10,000 to 8 million cfu/m³. Endotoxins ranged between 50 to 3,600 EU/m³ in the inhalable dust and 5 to 1,800 EU/m³ in the respirable fraction. **The presented data demonstrate that there are high to very high concentrations of air pollutants such as dust, micro-organisms and endotoxins in the air of animal houses which are also emitted in the environment.** The data can help to identify those animal production systems where most urgently mitigation techniques should be applied in order to improve performance and welfare of animal and man indoors as well as to reduce emissions. Future animal farming systems should be sustainable in relation to animal health and welfare, environment and occupational health aspects.

Key words: Air hygiene, poultry farming, dust, bacteria, endotoxin

Obstructive airway diseases caused by allergic compounds rose from about 90 in the year 1981 to approximately 700 in 1994, a slightly smaller increase from 8 to 50 was observed for obstructive diseases caused by chemical irritants or toxic compounds (Agricultural Occupational Health Board in Lower Saxony, 1996). A study comprising 1861 farmers in the north of Germany revealed that about 22 % of the pig farmers, 17 % of the cattle farmers and 13 % of the poultry farmers displayed airway problems such as asthma, asthma like syndrome, chronic bronchitis, mucous membrane irritation and organic dust toxic syndrome (Nowak 1998, Radon et al. 2002). The number of employees in animal farming receiving a pension from the professional sick fund because of an obstructive respiratory disease in Germany (BK 4301, 4302) rose from 17 in 2002 to 27 in 2003 (Prevention Report of the Agricultural Occupational Health Board in Lower Saxony and Bremen 2003).

The following excerpt outlines the different types of gases that can be released into the air by animal confinement facilities.

A PRIMER FOR WISCONSIN PRACTITIONERS AND HEALTH/SAFETY PROFESSIONALS

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The primary animal confinement gases of human health concern are **hydrogen sulfide (H₂S) and ammonia (NH₃)**. Carbon dioxide (CO₂) and methane (CH₄) are also formed and are considered simple asphyxiants and are of secondary concern. CO₂ is produced from animal respiration and is of concern if 5000 ppm or greater. CH₄ may be a risk for explosion at higher concentrations. **Bacterial decomposition of animal manure and urine results in the gas production. Hot summer days result in higher levels of gas production.** Under facility manure storage pits and outdoor lagoons contain both high levels of hydrogen sulfide and methane but also oxygen deficient environments at levels immediately dangerous to life and health (IDLH) that are insufficient to support human life. These environments can be toxic to animals and humans. They also are sources of lethal exposures in a farm child's home environment, as well as an occupational exposure. Concentrations of dusts and gases are higher in the winter when ventilation is decreased to save on heating costs.

You may also find more information on this topic by reading [Environmental and Occupational Health, 4th edition.](#)