




Protecting Workers in Livestock Buildings from Dust and Gases



PLAN
306.610-1
CPS M9707

PROTECTING WORKERS IN LIVESTOCK BUILDINGS FROM DUST AND GASES

N. Bird,¹ J.J.R. Feddes,² and W.D. Morrison³

INTRODUCTION

The atmosphere in livestock buildings, particularly where ventilation is limited, can adversely affect human health. The acceptable level of certain airborne contaminants is legally controlled in many industries. But not so in production agriculture, where levels of airborne dust and gases often exceed limits imposed elsewhere. To further worsen the problem, organic dust particles abundant in livestock buildings can interact with human physiological systems. In addition, ammonia (NH₃), another contaminant often present in the air in livestock buildings, can adsorb onto dust particles, which allows it to bypass some of the control systems in the respiratory tract and find its way into the alveoli of the lungs.

Workers may not immediately notice any ill effects from airborne contaminants, but numerous cases of delayed responses have been documented. Symptoms such as chronic bronchitis, coughing, wheezing, and allergies can gradually develop over a long period of time.

This publication informs livestock workers of the factors that increase levels of dust and gases in the air and explains how to prevent dangerous levels from occurring and how to protect themselves from long-term injury. Other Canada Plan Service leaflets are available that describe the potential dangers of silo gas and manure gas (leaflets M-7410 and M-8710, respectively).

SOURCES OF DUST

Dust is considered to be the most serious contaminant in the air in livestock housing. Referred to scientifically as airborne particulate, dust is measured in microns (μ),

where 1 μ equals 1/1000 of a millimetre; particles less than 50 μ are difficult to see with the naked eye. Large particles (over 30 μ in diameter) settle out of the air quickly. The particles of most concern are less than 10 μ , small enough to penetrate the lung tissue when inhaled. These respirable particles consist of foreign protein, grain dust, insect parts, fecal dust, soil, bacteria, endotoxins, mold spores, hair, feathers, scurf, and bedding material. Much of this material is biologically active. Protein levels of the dust often reach 30–35% and ash levels are also often elevated. As much as 90% of the dust particles in pig farrowing and nursing units is estimated to be respirable.

Dried fecal material that becomes airborne is usually in the form of small particles. This dry material contains proteins, bacteria, toxins, epithelial cells, and undigested feed.

Endotoxins from the cell wall of bacteria may be a significant component of fine dust. Endotoxins can cause adverse responses in humans, including inflammation of the lungs, fever, constriction of the air passages leading to the lungs, and coughs. Because barn dust is considered a biologically active material, researchers at the University of Iowa have recommended that it be limited to only 5% of the level allowed for other industrial dust. Levels of respirable barn dust should therefore not exceed 0.23 mg/m³, or 50 particles per millilitre.

During winter, poultry and pig barns in Canada have levels of respirable dust at least 3 times this limit, ranging from 0.8 to 5 mg/m³. Summer levels are usually lower because of high ventilation rates. Dust in feed-mixing rooms of dairy barns can also reach high levels, but most dairy units do not have dust levels as high as those found in pig and poultry facilities.

DEVELOPED BY CANADA PLAN SERVICE

Agricultural Engineering Plan Service

BRITISH COLUMBIA MINISTRY OF AGRICULTURE & FISHERIES

This publication informs livestock workers of the factors that increase levels of dust and gases in the air and explains how to prevent dangerous levels from occurring and how to protect themselves from long-term injury. To obtain a copy, contact:

CANADA PLAN SERVICE
Website: <http://www.cps.gov.on.ca>