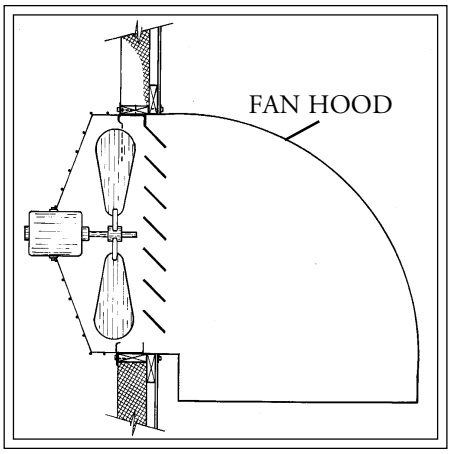
Management of Dust in Broiler Operations

Poultry FACTSHEET

This factsheet is intended to provide information about dust on broiler farms; where it originates; what it consists of; its impact; what can be done to limit the "in-barn" dust; and how to reduce the dust that leaves the barn.



An important management challenge facing the broiler industry is dust control. As urban development occurs in agricultural areas, the demand for effective dust control in broiler operations increases. Dust and feathers emitted from fans, particularly during clean-out, can be an annoyance to neighbors and if severe enough can be classified as pollution under the definition established by the BC Ministry of Environment Lands and Parks (BCMELP) in the *Waste Management Act*. Pollution, according to the BCMELP is defined as "The presence in the environment of substances or contaminants that substantially alter or impair the usefulness of the environment". While broiler operations that use normal farm practices are protected under the *Farm Practices Protection (Right to Farm) Act*, this legislation also requires that a producer meet the requirements of the *Waste Management Act* and *Health Act*.

Aerosols and Broiler Dust

Aerosols are solid particles in the atmosphere, either formed in the air by reactions among gases or injected into the air by processes on the ground. They consist of a variety of materials and vary in size from less than 1 micrometer (one thousandth of a millimeter) to the size of a sand grain. In poultry units, concentrations of dust aerosols may be up to 25 times greater than those found in an urban atmosphere.

Broiler dust is comprised of feather fragments, fecal material, skin debris or dander, feed particles, mold spores, bacteria, fungus fragments and litter fragments. Broiler dust is approximately 92% dry matter; chemically it is 60% crude protein, 9% fat and 4% fiber; calcium, derived from the feed, is the most common inorganic element, followed by magnesium and small amounts of copper, iron and zinc. Various gases which result from microbial decomposition of feces, are also common in poultry house air.

High dust levels enhance the awareness of odors. Odors are carried by airborne particles. Odorants such as acids, carbonyl compounds, and phenols attach to dust particles. The concentration of odorants on aerosol particles is approximately 40 million times greater than found in an equal volume of air.

Impact of Dust on Broilers and Broiler Barn Workers

The most harmful dust is aerosol dust (size range of 2.5 micrometers and smaller). These particles are small enough to reach the lungs when inhaled by birds or humans.

Barn workers that inhale poultry dust and gases have an increased risk of pulmonary disease, the primary symptom of which is pulmonary inflammation due to either hypersensitivity or allergic reaction.

Poultry performance is significantly affected by dust levels in the barn. A high level of dust in the barn increases respiratory disease, reduces growth, reduces feed efficiency and increases mortality.

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Factors Affecting Dust Levels

Dust levels in the barn vary with age of flock, the number of birds and the season of the year. Dust and gas concentrations increase with flock size and with flock age. Inside dust levels are higher in the winter because ventilation is decreased to conserve heat. Dust levels rise in the barns during clean-out and when birds are moved. Litter tilling can result in high levels of dust and odor in the barns. Computerized ventilation has helped to reduce the extreme levels of dust in both the poultry house and in the air discharged from the buildings throughout the production cycle.

Dust levels can vary due to bird activity, temperature, relative humidity, ventilation rate, ceiling height, feeding method and type of bedding. The quantity of dust produced in a broiler barn depends on the type of litter used and increases with litter age. Temperatures of 15.5 degrees C to 21 degrees C (60 F to 70 F) result in higher dust production than lower or higher temperatures. Particle dust less than 0.5 micrometer in diameter is highest at humidities between 45% and 60%, and declines at humidities of less than 45%. The lowest levels of aerosol dust occur at humidities of greater than 60%. More dust is produced during periods of illumination than during darkness due to higher bird activity.

Dust levels outside the barn may be an irritation to some neighbors particularly during clean-out. During clean-out there are two areas of particular concern: 1) When the litter is loaded into the truck via a conveyor, litter falling into the truck creates large amounts of dust. Feathers also blow from the conveyor into the air. 2) When air is used during "blow down" the dust levels exiting the fans can be very high. Also when the fan hoods are blown out clouds of dust are emitted which can drift for several hundred feet.

It is during clean-out that neighborhood complaints are most common. As poultry production operations increase in size, so will dust, odor and noise, unless corrective action is taken.

Use of Litter Amendments

When birds are double cycled on the same litter, as is often practiced in the industry during summer, dust and feather emissions to the environment may be higher. Some litter amendments have the effect of lowering litter pH and reducing pathogens, bacteria and fungi in the litter. Litter amendments that are pelleted are more effective in minimizing dust.

Particulate Matter from Incineration of Mortalities

Disposal of dead birds using an incinerator is an acceptable and recommended farm practice. Mortality incineration that meets the requirements of the *Waste Management Act* is required. All incinerators should have after-burners and should be operated and loaded according to specifications. Failure to operate the incinerators properly can lead to particulate and opacity levels which are greater than those allowed by BCMELP. When birds are loaded into the incinerator they should be placed away from the burner nozzle; the chamber should not be overloaded; and the birds should be distributed in the incinerator in a manner which allows for the flames to surround/engulf the mortalities. The incinerator should be operated at the temperatures specified to minimize opacity and particulate matter emissions. Follow all directions on specified operating procedures when operating the incinerator.

The *Agricultural Waste Control Regulation and Code of Agricultural Practice for Waste Management (Part 8, Section 23(1) (d)* sets emission standards at a maximum opacity of 20% and a maximum particulate emission rate of 180mg/m^3. Before purchasing an incinerator, check the specifications of the equipment for opacity and particulate matter emissions to ensure it meets the requirements of the BCMELP. If you have any questions contact Rick Van Kleeck (604-556-3108), Waste Management Engineer at the BC Ministry of Agriculture and Food.

Contacts:

For further information on poultry dust management, *Farm Practices Protection (Right to Farm) Act,* or dust complaint resolution contact the following BCMAF staff:

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What can growers do to reduce complaints from neighbors regarding dust from a broiler operation?

1. Siting of buildings on the property can have a significant impact on the potential for noise, dust, odours or other disturbances to affect your neighbours. Depending on the size and shape of the property and your future farm development plans, there may be opportunity to reduce the potential for conflict by maximizing the distance between a new barn and your neighbours.
2. Established a row of trees between your barns and the neighbors house. This will assist in reducing larger sized dust particle drift but is less effective in reducing light aerosol drift. A tree or vegetation buffer is recommended where vented dust becomes a problem to neighbors.
3. The buildings should be set up so that the vent fans are directed away from neighboring properties.
4. 24 and 36 inch fans should be hooded to ensure that dust and feathers leaving with exhausted air are directed towards the ground.
5. Choose a time for clean-out that minimizes inconvenience to your neighbors. For example, it is not advisable to clean out when people are sitting down to lunch or dinner, or when the neighbor has washing on the line. Farm Practices Protection (Right to Farm) legislation is to protect farmers against **unjustified** complaints. Good neighbor policy and consideration for neighbors are important in minimizing nuisance and environmental pressures on poultry farmers.
6. When purchasing a conveyor choose one with a housing or covering over the belt. Request that hired clean-out companies use coverings on their conveyor belts.
7. To minimize the potential for dust complaints, wash out fan blades, screening and hoods with water rather than blow them out with air,
8. Use modern up-to-date ventilation equipment to minimize exiting dust levels. Implementing state of the art ventilation is one of the best methods of avoiding excessive dust accumulation and emissions and ensuring efficient movement of air.
9. Strive to maintain litter moisture conditions which are not excessively dry or damp by establishing appropriate ventilation rates.
10. The recommended range for humidity is 60 to 75%. The minimum humidity is 40% and maximum 80%. Note that the generally recommended humidities for broilers of 50 to 75% are within the range where maximum dust is observed (45 to 60%). Humidity levels may have to be adjusted when dust levels rise. Molds and their contribution of spores and toxins to dust can be controlled by changing litter frequently and/or monitoring and controlling humidity.
11. Reduce the temperature during light periods. This will increase the humidity and reduce dust during the time when birds are active and feeding. Then, increase the temperature during dark periods when the birds are less active. This will minimize dust as well as improve feed efficiency.
12. Keep bird density levels within the BC Chicken Marketing Board (BCCMB) guideline (presently 2.57 kg/0.093 m^2 or 5.67 lbs/sq ft). Avoid densities, particularly during the summer, of greater than 2.57 kg live weight/square foot. Updates on density requirements can be obtained from the BCCMB at 604-556-2855. Excessive density can lead to environmental and animal welfare problems. High bird densities during excessively hot weather can result in a significant increase in mortality, resulting in economic loss.
13. A reduction in dust can be attained by adding a negative electric charge to moist fog.
14. Dust can be reduced in poultry houses by ensuring that pelleted feed is high quality. “Fines” in feed can contribute to higher dust levels.
15. Control of darkling beetles will reduce the contribution of insect fragments to the dust load.

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Health Concerns to Neighbors

Broiler barns are typically operated as a very sanitary animal food production system. Inputs of feed, litter and chicks are from government regulated sources.

However, neighbors will, from time to time, express concern about the impact of disinfectants used in broiler operations on their personal health, the possibility of developing allergies to poultry dust or the possibility of being infected by viruses and bacteria carried on dust particles from neighboring broiler operations.

1. Impact of Disinfectants

Broiler barns are thoroughly cleaned between flocks. Cleaning includes more than just the removal of litter. The barns are washed thoroughly with water and detergent. Dust is blown down from feeders waterers and fans. The barns are then disinfected with phenols, quaternary ammonium compounds or other types of disinfectants. These disinfectants represent little risk to the environment or neighborhood health or safety when applied according to specifications

2. Poultry Viruses

Neighbors should not be overly concerned about viruses found in poultry dust. There are very few poultry viruses that can affect humans.

The Avian Influenza strains of viruses that caused the Hong Kong flu are very specific types and have not been shown to exist in Canada. In Hong Kong, the wild bird population was the source of Avian Influenza virus which led to the Hong Kong Flu. Raising poultry outside and selling chicken live in the market place, a common practice in Hong Kong, compounds the risks to poultry handlers. In BC, chicken is generally grown in high biosecurity operations which exclude all wild birds. In addition, it is eviscerated and packaged in plants which have government health inspection. The modern industrial chicken production facility in BC minimizes risk of any spread of poultry virus to humans.

Newcastles virus can cause conjunctivitis in the eyes of vaccinators if eye protection is not used. This requires large exposure. However, Newcastles vaccine is not used on broilers.

Bronchitis, Bursal and Adenovirus are not shown to affect humans; there is no avian tuberculosis in broilers in BC and poultry Mycoplasma has no effect on people.

3. Poultry Bacteria

Neighbors should not be overly concerned about bacteria associated with poultry dust. Generally, dust levels are highly diluted by air as the vented dust from the barns enters the environment. There is almost no risk of neighbors being infected by bacteria associated with dust particles from broiler operations.

The ability of bacteria to infect people relates to the number of organisms or "bacterial load" and the "pathogenicity" of the bacteria. Pathogenicity is a genetic aspect of bacteria.

Each strain of pathogenic bacteria has a "load" below which there is little risk of causing disease or infection in humans. A normally healthy individual has an immune system that is capable of resisting bacterial infection. If a person has reduced immunocompetence, they may be more susceptible to infection. Very young or old people may have less ability to resist infection from bacteria. However, the chances of a person being infected with a bacteria from drifting poultry dust is very low.

Sensitivity and Habitualization

People from the city may perceive agriculture differently than farmers and/or people with a history of living in the country. Many city people when they move to the country expect to find poultry raised in a more traditional manner, perhaps in small flocks and even on pasture. Their view of agriculture production may be based on a historical perspective. Many are not aware of the housing, technology and investment associated with the modern poultry operation. They may perceive the modern production broiler unit as a non-agricultural operation or industrial operation on agriculture land. They may see large fans as industrial equipment; their noses are not "habitualized" to normal farm odors and their experience with dust in the city often has been limited to road repair or other construction. Their sensitivity to dust and odor may be much higher than people who have worked or lived on and around farms for several years. Therefore, when neighbors complain, assume that the complainants are sincere and make a real effort to deal with their concerns.

The basis of agriculture classification of land is for food production and modern food production is a commercial-industrial process. It is normal farm practice to use modern equipment in the production of broilers. Complaints about farming practices can be resolved using programs that are in place currently. However, continued public complaints and concerns with respect to dust and odor emissions from broiler operations may lead to increased regulatory pressure on the broiler industry. The industry, therefore, must be proactive in controlling dust and odors from their operations so as to minimize impact on the environment and on neighbors.

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