CPRC Update – Ammonia: Welfare impact and mitigation strategies

Commercial poultry operations can contribute significantly to the atmospheric burden of ammonia, which is considered to be detrimental to both human and animal health and the environment. Ammonia, the major noxious gas associated with poultry manure, is produced from microbial decomposition of nitrogenous compounds. Poultry are exposed to manure and manure gas through three exposure routes; inhalation, oral and through the skin, all of which could adversely affect bird welfare. Thus, the objective of this research is to evaluate control strategies that may reduce atmospheric release of ammonia from commercial poultry operations and investigate the effects of manure on bird health and welfare.

Ammonia mitigation strategies

Dr. Bill Van Heyst and his research team at the University of Guelph are studying control strategies that may reduce atmospheric releases of ammonia from commercial poultry operations. The objective of this research study is to determine the most efficient methods in which poultry operations can control their emissions of ammonia to improve in-barn air quality and limit emissions to the atmosphere. To accomplish this evaluation of control strategies, ventilation rates and concentrations of ammonia were measured in addition to production performance measures. To date, the researchers have evaluated the use of water sprinklers and poultry litter treatment. Studies using a centralized air exchange system are ongoing.

Poultry litter treatment was found to be an effective control strategy to reduce emissions of ammonia. Initial reductions in ammonia emissions immediately after poultry litter treatment application were found to be 72%. The overall average reduction in ammonia emissions was found to be 57%, lasting 11 days on average. Results from the water sprinkler campaign were inconclusive due to confounding factors in the barn. Preliminary evidence thus far suggests that the centralized air exchanger better controls the litter quality with lower moisture content and that this reduces ammonia production.

Welfare impact of ammonia

Dr. Alexandra Harlander, also from the University of Guelph, and her team are conducting research to evaluate the effects of manure on bird welfare. A series of experiments was conducted to examine the both short and long-term implications of exposure to manure on poultry welfare: (i) investigate how exposure to ammonia affects foraging and avoidance behavior in birds (ii) analyze whether different levels of airborne ammonia are affecting the birds preference for feeding time and duration, (iii) examine whether birds avoid foraging in areas with manure present, (iv) determine the relative preference for clean or dirty scratch pads of birds, (v) determine whether low nitrogen-containing diets increase the risk and incidence of fatty liver hemorrhagic syndrome and trigger behavioural impairment, and (vi) evaluate whether birds prefer

clean feed versus feed mixed with excreta, and how a likely choice affects problem solving behaviour.

To date, the researchers have investigated all objectives and data analyses is ongoing; however, preliminary results obtained to date show that: birds were able to discriminate between artificial and natural ammonia sources; number of manure belt operations did not affect the number of feeding events; birds have a relative preference for clean litter over litter substrate that has been present for the entire duration of their lives; birds visited more frequently and spent more time on dirty rather than clean scratch pads; and feeding nitrogen-reduced diets adversely impacted behavioural and/or cognitive abilities in birds.

The Next Steps

These projects are ongoing and will be completed in early 2018. Completion of the data analyses will fully explain the short and long-term implications of exposure to manure on poultry welfare. It will also determine the most efficient methods in which poultry operations can control their emissions of ammonia to improve in-barn air quality and limit emissions to the atmosphere.

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CPRC, its Board of Directors and member organizations are committed to supporting and enhancing Canada's poultry sector through research and related activities. For more details on these or any other CPRC activities, please contact The Canadian Poultry Research Council, 350 Sparks Street, Suite 1007, Ottawa, Ontario, K1R 7S8, phone: (613) 566-5916, fax: (613) 241-5999, email: info@cp-rc.ca, or visit us at www.cp-rc.ca.

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