



# CANFARMSAFE™

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## All Cooped Up - In a Nutshell Air Quality from Laying Hen Housing

The increasing public concern for animals to be raised, transported, and slaughtered humanely is pushing the livestock industry progressively towards improving animal welfare in Canada and around the world. However, air quality is an issue in these next-generation livestock buildings mainly due to an increase in animal activity and the addition of bedding materials. Workers are therefore put at a higher risk of developing both infections and non-infectious respiratory diseases (asthma and chronic bronchitis for example). These changes are particularly clear in the poultry industry where producers are moving away from conventional cages (Figure 1) to systems where hens can express more of their natural behavior, such as enriched cages and aviaries (Figures 2 and 3). The *Developing Strategies to Minimize Health Risks in Next Generation Livestock Buildings Integrating Modern Animal Welfare Considerations* project sampled 12 laying hen facilities in order to compare the air quality between conventional and alternative housing systems.



Figures 1 to 3: Conventional cages, enriched cages and aviary production systems

### Materials and Methods

Barns were selected in the south of the province of Quebec with mechanical ventilation systems and a similar number of hens. Samples were collected in the fall of 2020 and winter of 2021. Specialized sampling and analysis equipment was used to measure gas emissions as well as dust and bioaerosol concentrations (Figure 4).



Figure 4: Sampling and analysis equipment

## Preliminary Results

Some interesting observations can be made from the data of the 12 visited farms, but a complete statistical analysis from a total of 18 buildings will be used to confirm any trends or conclusions. As shown in Figure 5, ammonia ( $\text{NH}_3$ ) emissions were similar for both the conventional and enriched cage systems (2.9 to 3.8 mg/h/hen) but were much higher for the aviaries (around 14.5 mg/h/hen).

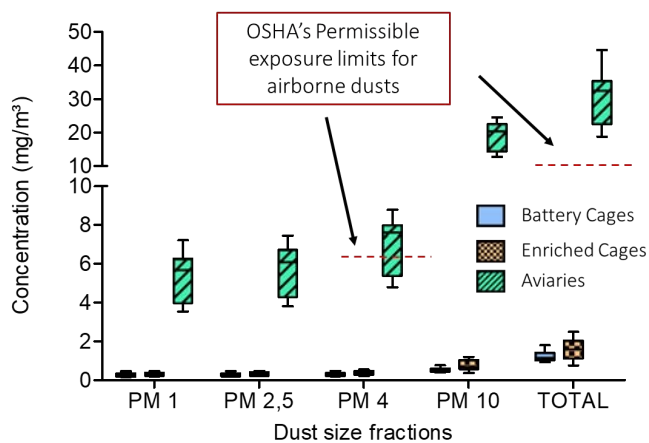


Figure 6: Dust concentrations

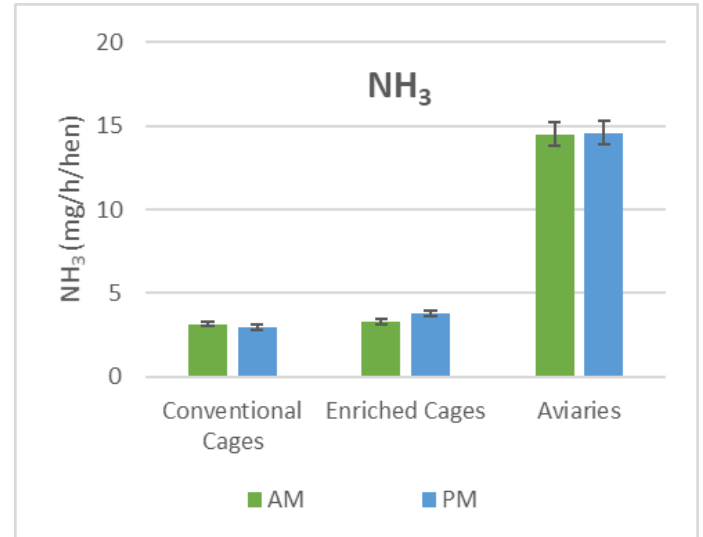


Figure 5: Ammonia ( $\text{NH}_3$ ) emissions

The concentrations of all airborne dust particle size fractions observed in aviaries were much higher compared to facilities with cage systems (Figure 6). In fact, the median total dust concentration was  $32.6 \text{ mg/m}^3$  in aviaries while values below  $2 \text{ mg/m}^3$  were observed in the battery and enriched cages.

Furthermore, except for culturable molds, concentrations of tested bioaerosols (airborne bacteria, bacterial fecal indicators - *Clostridium perfringens*, *Enterococcus* and *Escherichia coli*) all seemed to be more important in aviaries than facilities with cages.

## Conclusion

Cage-free laying hen housing systems, such as aviaries, are meant to allow hens to display a broader range of natural behaviors such as perching, dust bathing, foraging, scratching, kneeling, ruffling feathers and pecking activities. However, from the preliminary results, air quality in these housing systems is lower compared to systems with enriched or conventional cages. The next steps in this project will therefore focus on finding and testing strategies and technologies to reduce ammonia, dust and bioaerosols that can be implemented in commercial cage-free housing systems for laying hens.

