Research summary

Dietary strategies in laying hens to reduce ammonia emissions in egg production

About the study

The primary source of ammonia emissions in the egg farming industry is poultry manure, which is influenced by the hen's diet and other environmental factors such as moisture levels and pH balances. These ammonia emissions can present risks to the respiratory health of hens, egg farmers and their staff, and can result in adverse environmental consequences.

The standard practice to maintain acceptable levels of ammonia in barns is to increase ventilation to exhaust ammonia-laden air. In doing so, ammonia can deposit in neighbouring ecosystems where it can affect plant populations and biodiversity. As a respiratory irritant, ammonia can also influence poultry productivity and affect the air quality in barns, impacting workers' health and safety if allowed to accumulate to high concentrations.

A three-year research study completed in 2019 by scientists at Alberta Agriculture and Forestry sought to reduce ammonia emissions through dietary interventions. Research over the past two decades has lacked a holistic perspective on the effects of dietary modifications specifically in laying hens and has assessed typical Canadian feeding scenarios. This study sought to address these knowledge gaps.

Methods

The research team conducted an evaluation of several different strategies simultaneously, using a typical laying hen diet as its starting point. The project compared the effect of acidifying the diet and the influence of protein levels in hen feed. Additionally, they assessed nine commercial feed additives for their effect on hen productivity, egg quality and ammonia emission intensity.

The researchers prepared 19 nutritionally-complete diets made of different ingredients. Each diet was fed to eight groups of four hens (32 to 48 weeks of age) over a 16-week period. Production was recorded daily and average egg weight was calculated weekly.

EGG FARMERS OF CANADA

Findings

The substitution of limestone for gypsum as a source of supplemental calcium in hen diets resulted in as much as a 40% reduction in ammonia emission intensity and reduced the amount of ammonia emitted over a 16-week period by over 25%. This was achieved with minimal impact on hen productivity or egg quality. Additionally, optimizing digestible protein in hen diets also minimized ammonia emissions.

The research concluded that diets with both excess protein and low protein led to increased ammonia emissions. This outcome highlights the importance of focusing on levels of digestible essential amino acids in hen diets, particularly when reducing protein content.

None of the nine commercial feed additives tested were able to achieve any reduction in ammonia emission intensity over the course of the study.

Conclusions

This study demonstrates that a laying hen's diet influences the amount of ammonia excreted. By considering opportunities to optimize feeding programs that replace limestone with gypsum and a balance of digestible protein, egg farmers may reduce ammonia emissions through dietary interventions. These findings are significant to the Canadian egg farming sector as they consider the environmental sustainability of egg production and new measures to reduce ammonia emissions, enhance hen productivity and improve the air quality in barns. Additional research and larger scale on-farm pilots could be conducted to build on these results and identify further opportunities to modify diet to reduce ammonia emissions among laying hens.

About the researchers

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