# Can zinc reduce ammonia excretion in poultry houses?

AXEL MINETTO and JENNIFER

findings that potentiated zinc

could be part of this strategy

**MAURIN\*** present recent research

Ammonia in poultry houses is a major industry concern due to environmental issues and the health and welfare of birds and workers.

> n the poultry industry, concerns about ammonia (NH<sub>3</sub>) are many and include issues for performance, animal health and environmental impact. Retail industry marketers are issuing guidelines for the monitoring and reduction of ammonia within houses to address animal welfare concerns while pressure is also rising on the environmental side. More research is needed from the industry and academia to develop holistic methods of reducing nitrogen excretion.

### Ammonia excretion in poultry houses: any risks?

Nitrogen is a main component of poultry diets. A part of this nitrogen can be used by birds and incorporated into tissues or eggs, but most of it is excreted in the urine or feces in the forms of uric acid (around 80%), ammonia (around 10%) and urea (around 5%). Once the uric acid and urea are excreted, they are converted into ammonia through microbial and enzymatic breakdown found in manure. Ammonia (NH<sub>3</sub>) is an invisible and water-soluble gas released into the air and inhaled by both birds and farm workers.



Ammonia  $(NH_3)$  is hazardous to the environment. It may cause environmental problems such as acidification and eutrophication, disrupting biodiversity and reducing water quality. In the European Union (EU), the agricultural sector is responsible for the vast majority (93.3%) of total ammonia emissions.

When NH<sub>3</sub> gas is exposed to moisture, it reacts and forms a basic, corrosive solution called ammonium. This aqueous ammonium solution can cause damages to birds' respiratory tract and destroying epithelial cells. In such conditions, the mucus on the mucosal surface of the trachea cannot be cleared by cilia and thus bacteria become trapped and can cause infections when reaching lungs as example.

# Ammonia exposure level and effects on birds and workers

Both concentration and exposure time may influence the effect of  $NH_3$  on poultry and worker health. The Occupational Safety and Health Administration has an 8 hour exposure level at 50 ppm. The shortterm exposure limit (15 minutes) set by the American Conference of Governmental Industrial Hygienists is 35 ppm. The level that is considered an immediate danger to life and health is 300 ppm. While these levels refer to concentrations that might have negative impacts on human

Figure 2: Ammonia excretion.



health, similar recommendations for poultry have not been made.

 $NH_3$  in poultry houses lowers performance, increases disease susceptibility and creates troubles or death, when poultry remains in such an environment throughout the production period. The concentration standards have not been established yet, but initial proposals have ranged from 10 ppm as a goal to 25 ppm as a maximum level.

Maintaining such low concentrations is a challenge under current commercial production practices without the potential of putting excessive financial burden on poultry producers or a change in ammonia management.

#### Ammonia management in poultry production

For most broiler producers the goal is to avoid high concentrations of ammonia, or to control induced inflammations and minimize impacts on bird health and performance.

Here are some ways to reduce ammonia levels in poultry houses:

 Dietary management: Birds should be fed with a balanced diet fulfilling all the nutritional requirements. Excess protein in the diet will be excreted through ▷



BWG;FCR: linear p<0.05

- ✓ feces and will lead to more ammonia production.
  - 2. Stocking density: High density will lead to wet litter problem which may favor the production of ammonia.
  - 3. Proper ventilation: Barn should be ventilated to facilitate the quick release of ammonia from the house.
  - 4 Litter management: Litter moisture should be kept between 15-25%. High litter moisture will lead to ammonia problem in the poultry houses. Litter pH must be below 7 as it reduces ammonia formation.
  - 5. Feed additives that improve gut health, increase the gut integrity of the birds and the digestibility of nutrients. Less undigested and unabsorbed nutrients will be excreted through feces from a healthy gut, which means less nitrogen excretion from the birds to the environment.

Dietary management is used all around the world to reduce NH<sub>3</sub> excretion but the choice of feed additives can be another strong option to control ammonia production in some cases.

### Zinc bioavailability & microbiota modulation are keys to success

A recent trial published by Dankook University in South Korea revealed the interest of a highly bioavailable active form of Potentiated Zinc (Hizox, Animine). In this trial, the impact of several doses of potentiated zinc on performance, gut health, manure analysis and gas emissions in broilers was evaluated.

A total of 680 male broilers (Ross 308) was divided in 4 treatments with 10 replicates of 17 birds each, from day 1 to 35. The treatments consisted in a negative control with no zinc supplementation (32 ppm of native zinc) and potentiated zinc supplemented at 50, 75 and 100 ppm of zinc.

Results showed a significant doseresponse in nitrogen retention and dry matter retention of broilers fed increasing levels of potentiated zinc. As shown on Figure 1, the nitrogen retention and the dry matter retention from the feed increased with increasing levels of potentiated zinc (p < 0.1).

The improvement of retentions had an impact on ammonia excretion as birds fed with higher dose of potentiated zinc emitted less  $NH_3$ (p<0.05) as shown in Figure 2.

Finally, better retention of nutrients by birds coupled with less ammonia excretion positively influenced performance of birds. In fact, body weight gain and FCR were improved with increasing levels of potentiated zinc (p<0.05) as shown in Figure 3. This improvement of balance in the trial as potentiated zinc has the unique ability to shape intestinal microflora (p<0.05).

# Right dosage of potentiated zinc makes the difference!

Some feed additives have the ability to facilitate ammonia management in poultry such as potentiated zinc source. Applying the mineral precision feeding with the right dosage represents the golden opportunity to reduce ammonia excretion and to improve animals and workers safety without neglecting performance! *Ap* 

\*Axel Minetto (aminetto@animine.eu) Product Manager and Jennifer Maurin (jmaurin@animine.eu) Marketing and Sales Director, are both with Animine, France. References are available on request to the authors.