

Ammonia importance and Litter Treatment in modern poultry production

By Ivan Gospodinov

The detrimental effects of ammonia in poultry production have been known for years.

Numerous laboratory and field studies have shown how ammonia levels as low as 10 parts per million (ppm) affect birds health and performance. Ammonia levels above 25 ppm in the poultry house can damage the bird's respiratory system and allow infectious agents to become established, leading to declining flock health and performance.

While ammonia's effects are most evident during the first 21 days, the optimal ammonia level target is 25 PPM or less at all times to help fight off respiratory disease challenges and prevent weight loss. Research quantifying the detriment of ammonia exposure showed approximately a 0.5 lb. / 226 gr./ reduction in broiler body weight at 7 weeks of age when ammonia exposure increased from 25 to 50 ppm (Miles et al., 2004). During grow-out, many producers rely on ventilation to prevent ammonia build-up. However, economic and management constraints often prevent sufficient ventilation, especially during winter months, causing increased ammonia exposure which dramatically affects flock performance. The problem is compounded as bird densities and reuse of litter increase and layout times decrease.

The quality of the air in chicken or turkey houses is directly related to your birds' ability to respond to respiratory disease challenges and meet their genetic growth potential. Ammonia control is most important during the first 14-21 days of the bird's life, with the first 7 days being the most critical when chicks and poults are most susceptible to ammonia damage. Birds exposed to ammonia during brooding have decreased resistance to Newcastle Disease virus (Anderson, 1964) and have more difficulty in clearing *E. coli* from the respiratory tract (Nagaraja, 1984). More importantly, they experienced difficulties reaching the target weight and very often they are lighter than they needs to be.

E. coli bacteria can be significantly increased in the lungs, air sacs, and livers of birds exposed to ammonia because of damage that occurs to the tracheal cilia. Resistance to respiratory disease may be decreased. In addition, body weight, feed-efficiency, and condemnation rate may be higher in birds exposed to levels of ammonia exceeding 10 ppm.

The volatilization of ammonia has been attributed to microbial decomposition of nitrogenous compounds, principally uric acid, in poultry house litter. Litter pH plays an important role in ammonia volatilization. Ammonia (NH₃) is produced in animal manure by the breakdown of urea and in poultry manure by the breakdown of uric acid. Since ammonia is unchanged, it can be emitted as a gas. The gaseous emission of NH₃ can be inhibited if converted to NH₄⁺ (ammonium), which can be accomplished by lowering litter pH.

Once formed, the free ammonia will be in one of two forms: as the uncharged form of NH₃ (ammonia) or the ammonium ion (NH₄⁺), depending on the pH of the litter. Ammonia concentration tends to increase with increasing pH. Ammonia release remains low when litter pH is below 7, but can be substantial when litter pH is above 8. Uric acid decomposition is most favoured under alkaline (pH>7) conditions. Urease, the enzyme that catalyses uric acid breakdown, has maximum activity at a pH of 9. As a result, uric acid breakdown decreases linearly for more acid or alkaline pH values.

In the selection of a litter treatment product, we must identify the goals for application. Litter treatments may be cost-effective and justifiable under one or more of the following situations:

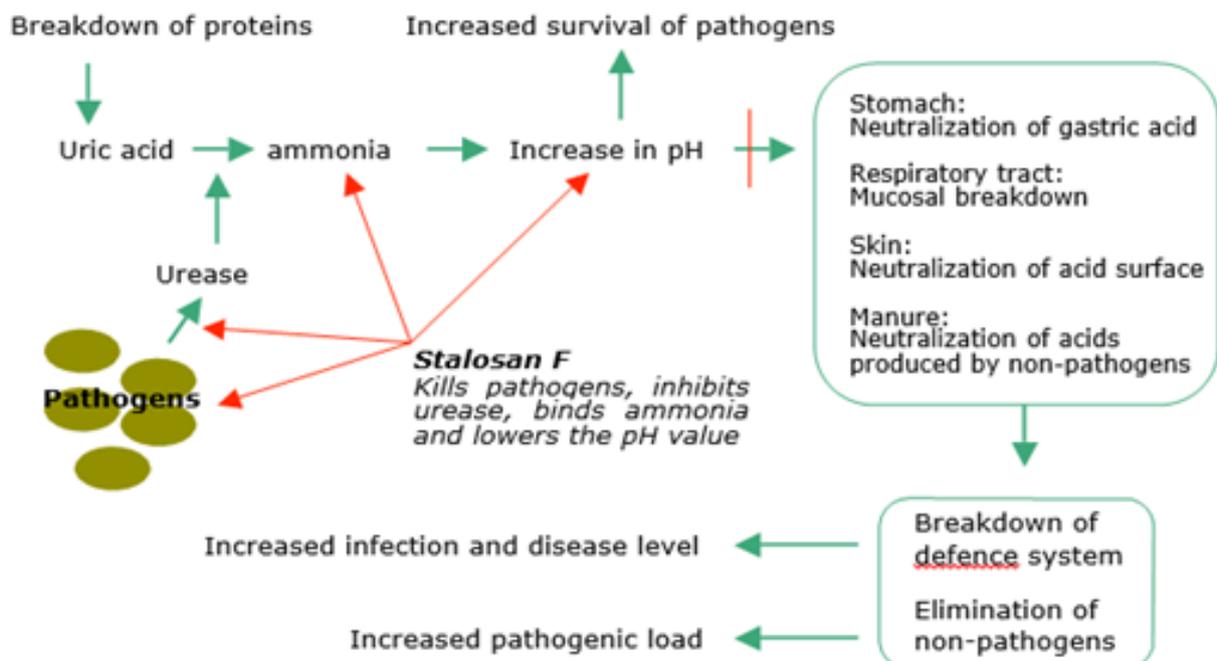
- cold weather
- short layout periods
- persistent disease challenges
- severe vaccination reactions
- reduction of ammonia-related stress
- prolonged litter reuse
- increased bird density
- address marginal management or housing situations

In general, the control of house ammonia levels is the primary purpose for using a litter treatment. In recent years, the reasons for using a litter treatment and any potential benefits from its use have expanded to include improvements in performance and environmental concerns. Some litter treatments may be used to enhance the composition of the litter as a fertilizer or as part of a best management practice to reduce foodborne pathogens. Ammonia-reducing litter treatments offer a potentially better in-house environment for both birds and producers. Although different litter treatments vary in their ability to control ammonia, each offers a unique set of characteristics that need to be considered in selecting the appropriate product to meet an individual's needs. The litter treatment that offers the best return on investment will depend on the user's ability to select the product that best meets application goals.

Stalosan F – professional litter treatment choice and highly efficient Ammonia control approach.

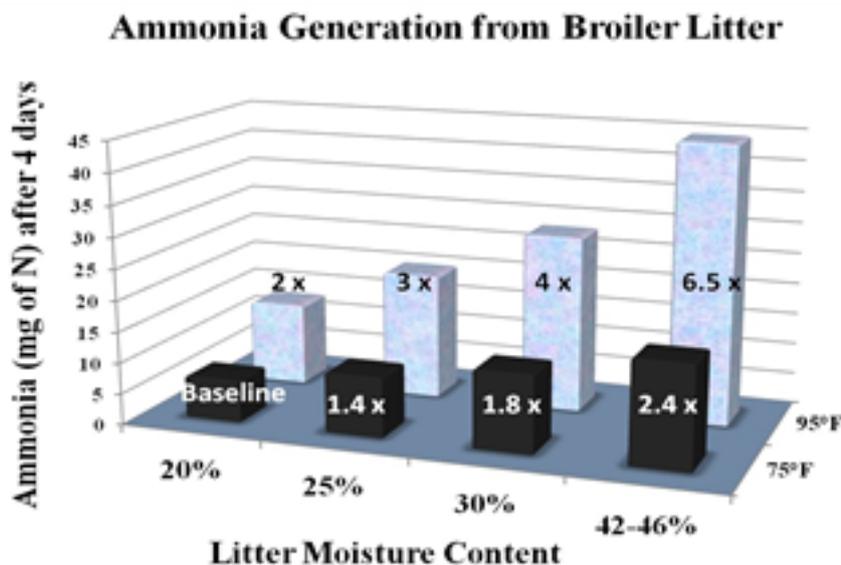
Stalosan F is a product manufactured by a Denmark based company Vitfoss. The product manifests itself in the form of pink powder. The existing composition of Stalosan F is based on synergism, where two or more ingredients reinforce each others effect. Stalosan F has been on the market 50 years already and since then it has been demonstrated numerous times it's great contribution to the animal health performance and even beyond.

Stalosan F perfectly match with modern poultry litter treatment requirements. Stalosan F composition makes this product a very effective and valuable tool when comes to ammonia control. Stalosan F inhibits the enzyme urease. That particular enzyme is released by many pathogens and catalyses the formation of ammonia. Stalosan F function as a buffer that chemically controls the levels of litter moisture, litter Ph value, ammonia emissions and other toxic gases. These processes are closely associated with Stalosan components mode of action /Fig. 1/



As the article stated above poultry litter pH plays an important role in ammonia volatilization. Ammonia concentration tends to increase with increasing pH. Stalosan F has a great potential to lower the pH value in poultry environment and this mode of action generally leads to suppressing ammonia formation and emissions.

Giving the fact that the volatilization of ammonia has been attributed to microbial decomposition of nitrogenous compounds, principally uric acid, in poultry house litter, we cannot separate the litter quality from the level of ammonia emissions and the below attached cartoon clearly indicates that.



As the graph above indicates / Fig. 2 / slight increases in litter moisture can translate into substantial increases in ammonia generation. The ammonia released at 75°F with 25% litter moisture is 1.4 times more than at the same temperature with 20% litter moisture. Further rise in litter moisture to 30% releases 1.8 times the ammonia. At 75°F / 24°C /, maximum ammonia volatilization occurs at approximately 42% litter moisture. As temperatures increase, the amount of ammonia produced is even greater. At 95°F / 35°C / and 20% litter moisture content, approximately 2 times more ammonia is produced than with litter at the same moisture content at 75°F. From that point, each additional 5% rise in moisture produces 3 and 4 times more ammonia when litter moisture is at 25% and 30%. At 95°F, the maximum generation occurs near 46% litter moisture.

It becomes apparent that poultry litter treatment with products such as Stalosan F with his components as Silicates , Phosphates and Sulphates which possess excellent absorbing and water holding capacity will definitely prevents or completely eliminates the existing threat linked with increasing litter moisture. The combination of these components also play a very important role in lowering the pH value of poultry litter which is directly related to lowering ammonia emissions.

Based on the details stated above a conclusion can be drawn that weekly Stalosan F litter treatment makes this product a value creating alternative when comes to adequate poultry litter and ammonia management.

From a practical stand point this statement is supported from a recently performed study in Australia clearly indicates that there is an immediate reduction in NH₃ levels in poultry houses after each Stalosan application. Reduction achieved ranged between 44% to as much as 74% as testing was undertaken after each application.

The study also concludes that Stalosan F is a highly effective binder of ammonia and enables the producer to reuse the litter comfortably at least 3 times. Stalosan F demonstrated an ability to manage the NH₃ levels and protect the overall health of the birds.

Some of the most important benefits Stalosan F contribute to the proper litter management are:

- Reduces ammonia production and bacterial challenge - improved immune function response
- Footpad quality improvement - less skin burning
- Increases litter amendment activity
- Increases fuel efficiency during preheating and brooding
- Maintains healthy floor moisture
- Reduces health risk
- Compliance with nutrient management guidelines
- Reduces environmental impact

