

How to increase energy utilisation in poultry diets

For many years, commercial feed manufacturers and farmers have been faced with the challenge of reducing feed costs without compromising bird productivity. This is an important consideration as feed constitutes the highest variable cost in poultry production, accounting for at least 70% of total production costs.

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Feed is just one of the challenges for those involved in poultry production to provide birds with a balanced diet, at the lowest cost, yet still produce eggs and meat that meet the customers' requirements and attract premium prices to maximise profit, all while meeting environmental and animal welfare requirements.

Energy is the most expensive nutrient when formulating poultry diets and that is unlikely to change given the stiff competition for available energy sources for human food. This means energy feed ingredients are becoming scarce and expensive for use in poultry production.

The continuous increase in the cost of feed ingredients (like maize and wheat) has forced feed manufacturers and farmers to use more by-products of grain milling in their rations.

These by-products are highly variable in their nutrient composition and are low in energy density compared to whole grains. This often results in poor feed intake, weight gain, feed conversion ratio (FCR), and general low productivity of the bird.

Thanks to genetic improvements, modern chickens consume less feed

per unit of body weight gain and reach their target weight in fewer days than their predecessors. As a result, the level of nutrients needs to be adjusted. The high cost of supplemental energy necessitates the optimisation of metabolisable energy (ME) in the diets, especially during the period when feed consumption is at its highest.

Feed intake and feed efficiency in poultry is regulated, at least in part, by ME levels.

Fast-growing animals, such as broilers and layers, require substantial amounts of energy to grow muscle tissue. All animals get the energy in their cells from adenosine triphosphate (ATP).

The amount of ATP in cells is strictly regulated, and it is only available for a short period of time; characterised by a high need in energy.

Creatine plays a key role

Creatine plays a key role in energy balance in muscle cells. The system 'creatine phosphate/creatine' acts as a buffer, guaranteeing the permanent availability of ATP molecules. Creatine phosphate is a dynamic storage of energy-rich phosphate and ensures a stable supply of ATP/ADP in the cell.

High-performing animals need creatine to support their muscle growth. Evonik Industries has developed a feed additive called GuanAMINO which contains guanidinoacetic acid (GAA).

This innovative form of GAA is an amino acid derivative and natural precursor of creatine. Creatine, known in the form of creatine monohydrate in athletes' nutrition, plays a vital role in energy metabolism, particularly of muscle cells. Formed mainly in the kidney from the amino acids glycine and arginine, GAA is transported to the

Nutrients	Matrix values (%)
Guanidinoacetic acid (GAA) content	96
Digestibility	100
Crude protein	221
Arginine content (Arg-sparing)	>77
Arginine digestibility	100
AMEn poultry (Energy-sparing)	>347 MJ ME/kg GuanAMINO or >83,000 kcal/kg GuanAMINO

Table 2. GuanAMINO matrix.

liver, where it is transformed into creatine.

The body can replace creatine losses to a certain extent through de-novo synthesis, nevertheless, the remainder must be supplied by the diet. In high yielding animals such as meat type broilers and laying birds the inevitable creatine loss may be a performance limiting factor, especially in the absence of animal byproducts in the diet, such as fish meal, which contain creatine.

The addition of GuanAMINO to poultry diets has proved effective in improving energy utilisation and FCR. It is also beneficial in diets low in arginine because the de-novo synthesis of creatine utilises arginine and so this additive promotes growth due to an arginine sparing effect. Arginine is required in high concentration by poultry because they are unable to synthesise this amino acid in vivo.

With high prices for oilseed meals, lower protein diets have become more common. Low protein diets are marginal if not deficient in arginine. Arginine is the rate-limiting factor for GAA (and creatine) biosynthesis. Because GAA is the direct precursor of creatine, GAA should also be capable of sparing arginine.

GuanAMINO is added to the feed over the entire growth period at 600-1,200g/ton of feed. The recommended dosage per species is shown in Table 1.

GuanAMINO provides a good return on investment when formulated into the feed and this comes from its energy and arginine sparing effect. Nutritionists are

advised to include GuanAMINO as an ingredient with the matrix shown in Table 2 and then enter it at its market price and put a maximum inclusion rate on the ingredient as the dosage given, then run the least cost formulation in the software.

The software will pick GuanAMINO by itself. In this way, the nutritionist is able to optimise the formulation without exceeding the recommended dosage.

Those formulations will always be cheaper than one formulated by adding GuanAMINO on top and will perform better than diets formulated without supplementing GAA.

Proven benefits

The proven benefits of using GuanAMINO supplementation include:

- Reduced feed cost resulting from energy and arginine sparing mainly in layer and broiler feed.
- Reduce FCR up to 9.3 units.
- Improved final body weight by up to 125g and average daily gain by 3.4g.
- Improve hatchability and fertility of eggs in breeder birds and enhance performance of their progenies.
- Optimised breeder reproductive traits lead to an increased number of marketable day-old chicks.
- Increased carcass yield (lean meat).

GuanAMINO can be put in compounded feeds and in premixes and is stable in most processing and environmental conditions.

Table 1. Recommended dosage levels of GuanAMINO.

Species	Layers	Grower broiler	Broiler breeder	Turkey grower
g/ton of feed	600	600	1000	800