The benefits of Omega 3 fatty acids in poultry breeder nutrition

Growth in the global consumption of poultry meat has continued to accelerate exponentially in recent decades, driven largely by growing global populations and incomes. It is projected that the increase in demand will be 13.1% between now and 2030, according to the Agricultural Outlook 2021-2030.

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Similarly, in the past decade, world egg production has increased by 24%, reflecting increasing consumption. This trend is expected to continue into the coming decade, particularly in developing countries, with changing dietary habits moving towards more protein foods like poultry meat and eggs, driven by increasing disposable incomes.

To meet this growing demand for poultry products, modern poultry is undergoing intensive genetic selection, targeted at increasing reproductive efficiency, rapid growth rates, superior feed conversion and cost-effective production cycles.

On the other hand, intensive breeding selection for improved performance has significantly exacerbated the occurrence of metabolic disorders due to high nutrient intake, rapid growth, and high metabolic rate.

Examples include stress, lowered immunity and insufficient skeletal development to support greater body weight. This is further complicated by consumer pressure and mandated termination of production practices involving indiscriminate use of antimicrobial growth promoters.

An innovative and sustainable strategy is required, for breeder nutrition and management, that can improve reproductive performance, immune status, skeletal development, chick quality, robustness, and resilience to stressors in the production environment.

Functional polyunsaturated Omega 3 fatty acids (FA) namely EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) have been shown to benefit fertility, immunocompetence, skeletal, and gastrointestinal (GIT) development in poultry.

These fatty acids cannot be endogenously synthesised by poultry, and therefore must be supplied directly in the diet. Fish oil and marine algae are the key sources of the Omega 3 FA, with the latter having more sustainability credentials due to dwindling global fish stocks.

UFAC-UK have developed a sustainable, environmentally friendly, algal source of Omega 3 FA, with 18% DHA, using algae rather than fish oils.

Their Algi18DHA is a traceable, sustainable, high-quality source of Omega 3 FA. The algae are produced from an environmentally sustainable process on a large scale, using photobioreactors and open ponds, then harvested and processed to produce a functional Omega 3 supplement. This enables Omega 3 FA to be successfully utilised in poultry breeder feeds to improve semen quality and preservation, gut health, immune responses, bone mineralisation and skeletal development.

Increased semen concentration

Poultry semen is characterised by high concentrations of polyunsaturated fatty acids, and in particular DHA, which provide fluidity and structural integrity of the sperm cell membrane.

Researchers have pointed out that supplementing the diet of broiler breeder roosters increases semen concentration and the percentage of the viable cells that is normal.

During cryopreservation, which is a process involving freezing for purposes of preservation, fertility and quality of semen can be affected and fatty acids are known to provide protection.

Dietary Omega 3 FA treatment of turkey male breeders has been reported to help prevent the negative influence of sperm storage sensitivity, quality and death, while benefitting from improved motility, membrane functionality, and viability.

Increased egg production

Research studies conducted by UFAC-UK have demonstrated that supplementation of a layer diet with 1.0% microalgae powder

Continued on page 27

Continued from page 25
(DHA content 37.6% of total FA) increased egg production from 43 to 46 weeks. Egg shell thickness was also improved.

In the trials, a total of 320 ISA Brown laying hens on a Brazilian farm were randomly assigned to a control group and treatment group. Each group consisted of eight replicates of 20 birds. The control group was offered a basal layer diet. The treatment group was fed the basal diet supplemented with 1% Algi18DHA.

Dietary supplementation with Algi18DHA had a significant effect on feed efficiency (gram of feed per gram of egg produced), egg weight and incorporation of DHA in the eggs, representing a 53% transfer efficiency from feed to egg.

The intestinal lining of the supplemented hens also had greater villus height and villus surface area compared with the non-supplemented birds. Feed intake and body weight were the same in both the control and treatment groups.

Of particular interest is the enrichment of the egg with Omega 3 DHA, which in breeders would be transferred to the embryo and benefit progeny's immune systems in the early stages of growth.

Overall, there is increased profitability to egg producers and poultry breeders alike due to the premium price paid for value-added eggs and improved survival of the chicks.

Omega 3 FA fed to breeder hens are taken up in the yolk and transferred to the developing embryo, where they are incorporated for optimal cell, tissues, and organ development. In particular, DHA imparts unique properties on cell membranes which contribute to membrane plasticity, fluidity and permeability that can boost immune response in chicks.

Chicks newly hatched from eggs enriched with DHA stand to benefit from reduced proinflammatory eicosanoids, enhanced bone mineralisation as well as modulation of the morphological structure of the digestive tract, to prevent pathogenic microbial colonisation and infection.

Skeletal development

Poor skeletal health and lameness in breeder hens is a major welfare and economic problem with negative perception of poultry production worldwide. Researchers at Bristol University in the UK reported a drop of more than 35% in bone breakage rates in free range laying hens at weeks 50 and 62, when supplemented with Omega 3 FA. Similarly, work in the US has demonstrated that dietary supplementation of breeder growers from day 1 to 17 weeks of age, with a microalgae source of Omega 3 FA, improves both tibia and humerus breaking strengths.

Oxidative stress reduces immune response in poultry, and supplementation with natural antioxidants is attracting more interest in research. An intake of moderate levels of Omega 3 FA, in combination with selenium and vitamin E, increases levels of antioxidant enzymes, and enhances antioxidative capacity in poultry. This therefore helps minimise oxidative stress.

At moderate dietary levels these fatty acids reduce oxidative stress which would otherwise lead to multiple metabolic disorders. To date, however, little attention has been paid to the beneficial effects of Omega FA in poultry breeder nutrition.

Algi18DHA provides a sustainable, high-quality source of Omega 3 FA, with a potential to improve poultry breeder performance and chick quality. ■