Optimising breeder performance through enhanced livability

Enhancing breeder reproduction performance often encompasses practices to favour mating behaviour and support the biological reproductive processes of birds. However, maintaining the survival of breeders until the end of their reproductive life is at least as crucial.

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Broiler breeding goals have expanded vastly in recent decades, combining productivity and biological efficiency with livability and reproductive performance. The productive requirements for this continuous improvement process are not expected to slow down. Poultry production is still strongly expanding globally with notable surplus gains. Therefore, breeders must be able to express their genetic potential in many different production environments and practices, adapting to a wide range of rearing conditions.

The strong demand for animal protein, particularly from poultry, has been driving the need to implement new production units for day-old chicks (DOC). However, limitations related to environmental aspects, regulations, animal welfare practices, infrastructure cost, equipment, labour and land costs have become enormous challenges for poultry breeding companies looking to expand their breeding stock. These limitations have led to a major imbalance in the supply of DOC in the international market. In addition, even for the existing facilities in operation, increased costs for food, health, labour and genetic material, directly impact the cost of chick production that has reached levels never seen before.

Given DOC's high added value, poultry breeder producers continue to look for alternatives that support high chick production efficiency, adaptation to welfare standards and sustainable production. Any practices or technologies that can benefit the number of chicks produced by the number of breeders housed become highly relevant. The technological developments required to meet this demand for greater DOC production efficiency must focus on the search to improve the reproductive performance of birds, the number of fertile eggs, incubation processes, embryonic viability, hatchability and the quality of hatched chicks. These parameters are influenced by various biotic and abiotic factors that must be considered when optimising the efficiency of a breeder operation.

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Reproductive efficiency

The reference parameter for the reproductive efficiency of batches of heavy breeders is the maximised production capacity of fertilised eggs by the number of birds housed in the production units. Unfortunately, fertility, hatchability, or embryo livability have low heritability, making genetic improvement in this direction extremely challenging. Therefore, to support reproduction performance, adopting practices to favour mating behaviour and enhancing the biological reproductive processes of birds are the primary approaches to take. However, maintaining the survival of breeders until the end of their reproductive life is also crucial.

Flocks that, for some reason, have been impacted by reduced breeding bird livability will inevitably have their chick production capacity decreased. This capacity reduction can be further aggravated by the reduced livability of young breeders that have great potential for early fertilised egg production. The sanitary management of breeding birds should receive as much attention and care from producers as productive management, since sanitation and biosafety affect livability, directly impacting the number of eggs that breeding flocks can produce. In addition, these biosafety and breeder health precautions must be taken in the housing of future breeders, during the production of hatching eggs, right up until removal from the breeder flock.

Immune system

Robust health management programmes go far beyond following a typical 'vaccination schedule', as widely advocated by genetics companies in their familiar production guidelines. Besides the hygienic conditions in which the birds are reared, it is essential to understand the main epizootic risks

and strains of prominent unfavourable bacteria to which the birds are exposed in the respective regions and production environments, to determine which preventive approaches to select. However, for optimal efficiency of the vaccines administered, the immune health potential of the birds also needs to be taken into account.

Modern commercial poultry breeders seem to have limited immunocompetence and low resistance to stressors, leading to lower livability. Unfortunately, genetic selection for performance traits may negatively impact immunity. Optimising the immune health of breeder birds is vital to maintaining their overall health as a direct effect and, indirectly, that of their offspring. Many technologies have been developed to optimise the immune response capacity of breeder poultry flocks. Thus, efforts have also focused on exploring the development and potential for using natural immunomodulators.

Natural immunomodulators

Several recent studies have described the dietary addition of a natural immunomodulator based on a postbiotic from a *Saccharomyces cerevisiae* fermentation product in broiler breeder feeds that can modulate birds' innate and humoral immunity. This addition can also increase T-cell repertoires in the spleen and blood, indicating an upregulation of cellular immunity. These effects potentially accelerate the formation of specific immune protection after vaccination against several harmful bacteria of interest. The response to the postbiotic addition may modulate the innate immune system, thereby priming the defence mechanisms and shortening the time to establish the adaptive immune response. This, in turn, gives a crucial response speed to help combat challenges in flocks, which may be translated into improved livability under such challenging conditions.

Plant extracts are another nature-based technology that has attracted the attention of researchers and poultry producers as a possible solution to support the health and livability of poultry breeders throughout the production period. The addition of what are known as 'phytogenic feed additives' (PFA) in poultry diets to support health has been widely observed in experimental and field conditions. Besides the known enhancement of gut functionality and fertility reproductive parameters, the addition of phytogenics to broiler breeders' diets has been shown to help stimulate the expression of innate immunity-related genes and support host defence against challenges encountered in production settings. Other identified and widely studied benefits of botanical substances are related to observations on the downregulation of physiological markers of inflammation and protecting the organism and cells from oxidative damage.

Beneficial combination

The combination of postbiotic and PFA technologies in the same feed seems to align with and may support producers' goals of increasing the number of DOC through improved breeder livability. Studies have shown that the beneficial functionalities of postbiotics and phytogenics interact simultaneously with the immune system and potentially play a dual role in supporting the health and well-being of breeders. The combination boosts the immune processes from many angles, from the modulation of innate response to the effectiveness of inflammatory reactions. Moreover, in parallel to their effects on the immune system, both technologies could potentially support many other demonstrated metabolic effects, such as driving gut microbiota, enhancing nutrient utilisation, stress alleviation, supporting anti-oxidative and reproductive hormonal mechanisms, etcetera, that may be crucial for achieving optimal reproductive flock livability and DOC production.

References available on request

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