

Micronutrition & Health Solutions Article

Supporting the Antioxidant Status in Poultry and Swine: The Power of Plant Polyphenols

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In the swine and poultry industries, optimizing oxidative metabolism is essential for supporting animal health, growth performance, and overall productivity. Oxidative metabolism, which involves the efficient production of energy using oxygen in cellular processes, plays a critical role in supporting physiological functions such as growth, reproduction, and immune response. Enhancing this metabolic pathway helps animals better manage stress, promotes feed efficiency, and reduces the risk of metabolic disorders. By strengthening oxidative metabolism, producers can ensure healthier animals, improve feed conversion rates, and ultimately boost profitability in a sustainable manner.

Proviox™ 50, part of Cargill's Micronutrition and Health Solutions portfolio, offers a scientifically backed solution to address these challenges, particularly in poultry and swine.

Challenges in Poultry

The global demand for poultry products has skyrocketed, making poultry the most consumed livestock commodity. Modern intensive farming practices pose additional challenges to poultry production with higher stocking density, stress, poor quality of litter which increase bird's exposure to infectious diseases. Historically, antibiotics were used to prevent diseases and promote growth, but restrictions on their use leaves birds vulnerable to bacterial infections, viruses, parasites, and toxins, and therefore have made alternative methods necessary.

Poultry production can be further compromised by environmental stressors like extreme temperatures, overcrowding, and nutrient deficiencies, weakening their immune systems. Disease outbreaks not only lead to reduced growth and performance but also have significant economic impacts due to increased mortality and treatment costs.

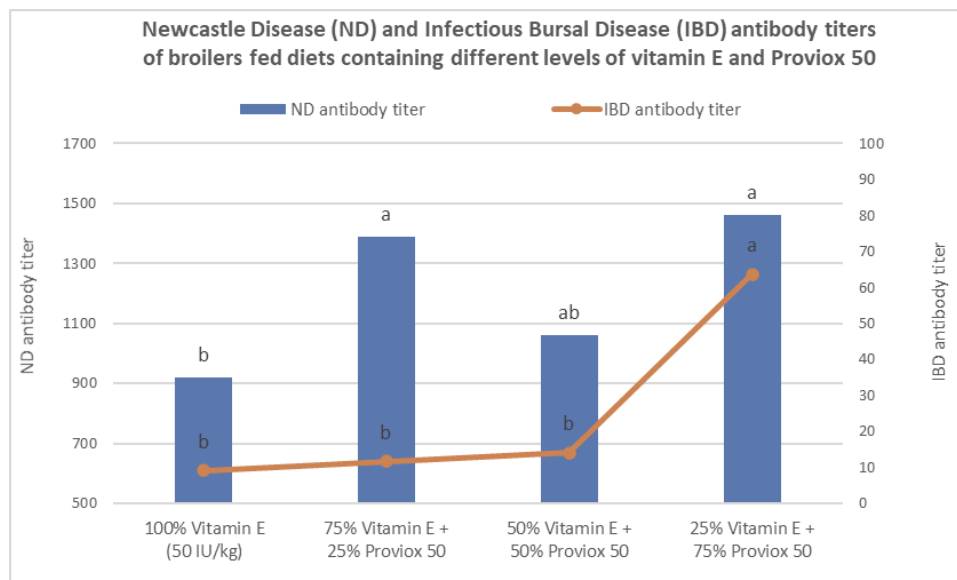
Proviox™ 50, a key product in Cargill's Micronutrition and Health Solutions portfolio, offers a proven solution for poultry producers. This product is a scientifically-backed antioxidant feed

solution made from plant polyphenols with potent antioxidant properties. It not only protects animals from oxidative stress but also supports their immune function, especially during challenging production phases.

Immune Response in Broiler Chicks

A study by Iqbal *et al.* (2015) demonstrated the benefits of Proviox™ 50 in improving the immune response and antioxidant status of broiler chicks. In this trial, the diets of one-day-old Hubbard broiler chicks were supplemented with Proviox™ 50, replacing 25%, 50%, or 75% of vitamin E. The results showed improved antioxidant status in the breast and leg muscles, along with a stronger immune response following vaccination against Newcastle Disease and Infectious Bursal Disease. The partial replacement of vitamin E with Proviox™ 50 resulted in higher antibody titers, demonstrating a significant immune boost in birds (1).

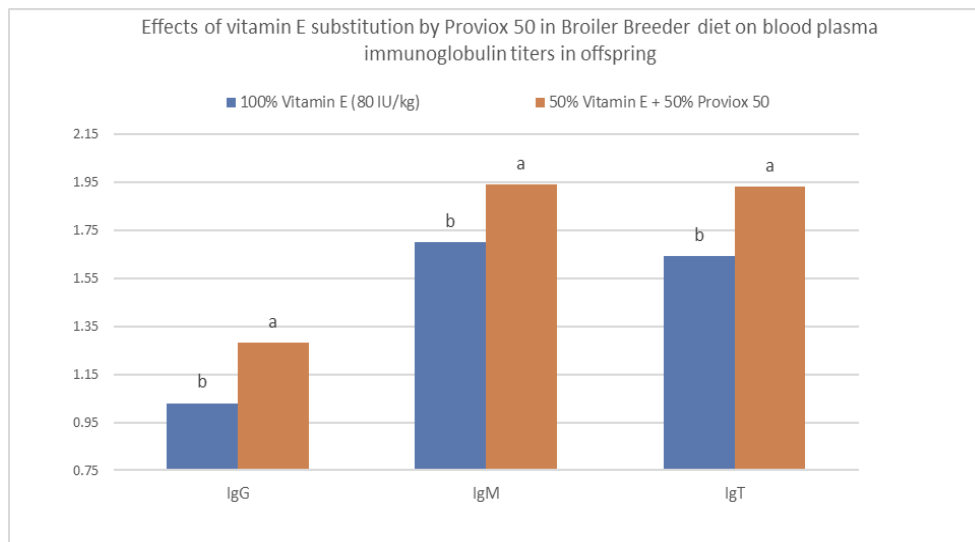
Figure 1. The replacement of part of the vitamin E by Proviox™ 50 improved the secretion of antibodies following vaccination against Newcastle Disease and Infectious Bursal Disease.



Immune Response in Broiler Breeder Offspring

In another trial, the offspring of broiler breeders fed a diet where 50% of vitamin E was replaced with Proviox™ 50 had significantly higher levels of serum antibodies (IgG, IgM, IgT), compared to the control group. This indicated a stronger immune response, further indicating Proviox™ 50's effectiveness in supporting poultry health (2).

Figure 2. Effects of vitamin E substitution by Proviox 50 in Broiler Breeder diet on blood plasma immunoglobulin titers in offspring



Challenges in Swine

Recent research continues to highlight the importance of managing oxidative stress in swine, particularly given the advancements in genetic selection. Studies such as those by Lipinski (2019) (3), Pastorelli (2022) (4), and Silva-Guillen (2020) (5) illustrate the growing role of polyphenols in improving antioxidant status and overall performance in both sows and piglets.

Continuous genetic selection in pigs has led to hyperprolific sows producing larger litters at birth and demanding more milk. While this has improved efficiency in the swine industry, it has also put modern sows under significant metabolic stress. During late pregnancy and lactation, sows need to support the growth of fetal tissues, mammary tissues, and milk production, which can push them into a catabolic state. This means they break down their own body tissues to meet these demands, which results in the excessive production of free radicals and increased risk of oxidative stress. Piglets, like sows, also experience the effects of this genetic progress. Faster growth and higher metabolism lead to more free radicals, and when combined with stressors such as weaning, crowded living conditions, or exposure to undesirable microorganisms, can increase oxidative stress levels. This imbalance between free radicals and antioxidants can cause significant biological damage, affecting cell membranes, proteins, and even DNA. Over time, oxidative stress can weaken animals, reducing their growth and overall performance.

To manage oxidative stress and promote better health and performance in pigs, antioxidants like Proviox™ 50 are essential. They help neutralize free radicals, protecting the pigs' metabolism and improving the quality and shelf life of livestock products. Proviox™ 50 is used across different stages of swine production, including for sows, piglets, and hogs, helping to maintain animal health and efficiency.

Immune Support in Piglets

A 2016 trial at the Cargill USA Research Center investigated the effects of Proviox™ supplementation in sows and their progeny. Piglets whose mothers were fed a diet with Proviox™ 50 and vitamin E exhibited higher levels of IgG at 42 days post-weaning compared

to piglets from sows fed vitamin E alone. This suggests that Proviox™ 50 enhances the transfer of maternal immunity, supporting the piglets' immune systems during their early life stages.

Impact on Immune Function and Sanitary Conditions

In a 2018 trial, piglets were divided into groups based on different levels of vitamin supplementation and sanitary conditions. Regardless of the level of vitamins, pigs supplemented with Proviox™ had higher IgG levels, indicating a stronger immune response. Piglets in clean conditions supplemented with Proviox™ 50 and the recommended vitamin levels showed the highest IgG levels, proving the product's ability to support immune function.

Effect of Peroxidized Oils

Peroxidized oils are associated with increased inflammation and morbidity. A 2020 study conducted at North Carolina State University examined piglet fed peroxidized oils and supplemented with Proviox™ 50 + vitamin E (Silva-Guillen et al., 2020). The results showed a reduction in serum cytokine levels, indicating lower inflammation levels in the Proviox™-supplemented pigs compared with those pigs without the product.

Conclusion:

As global demand for poultry and swine products increases, the pressure on producers to maintain animal health and productivity intensifies. Proviox™ 50 addresses a key challenge in monogastric species by providing antioxidant support, supporting immune function, and promoting overall performance. By incorporating Proviox™ 50 into poultry and swine diets, producers can help reduce production costs and ensure more resilient animals. To find out more about how Proviox™ 50 can help you and your animals thrive, and about our Micronutrition & Health Solutions portfolio, visit us online or contact our teams of experts across the world.

1. Iqbal, Z., Kamran, Z., Sultan, J., Ali, A., Ahmad, S., Shahzad, M., Ahsan, U., Ashraf, S., & Sohail, M. (2015, June). Replacement effect of vitamin E with grape polyphenols on antioxidant status, immune, and organs histopathological responses in broilers from 1- to 35-d age. *Journal of Applied Poultry Research*, 24(2), 127–134.
<https://doi.org/10.3382/japr/pfv009>
2. Nijmeijer, I.B. (2014). Proviox, Organic Minerals, and Canthaxanthin in Broiler Breeder Diets and its Relation to Offspring Performance.
3. Krzysztof Lipiński, Zofia Antoszkiewicz, Magdalena Mazur-Kuśnirek, Daniel Korniewicz & Sylwia Kotlarczyk (2019) The effect of polyphenols on the performance and antioxidant status of sows and piglets, *Italian Journal of Animal Science*, 18:1, 174-181, DOI: 10.1080/1828051X.2018.1503043
4. Grazia Pastorelli, Rachida Benamri, Massimo Faustini, Roberta De Bellis, Valentina Serra, Lauretta Turin, Marc Haumont, Philippe Durand, Laura Bianchessi, Emmanuelle Prost-Camus, Thomas Pecqueur, Michel Prost. Partial replacement of synthetic vitamin E by polyphenols in 2 post-weaning piglets. *Antioxidants* 2022, 11, <https://doi.org/10.3390/antiox12091752>

5. Y. V. Silva-Guillen, C. Arellano, R. D. Boyd, G. Martinez and E. van Heugten (2020). Growth performance, oxidative stress and immune status of newly weaned pigs fed peroxidized lipids with or without supplemental vitamin E or polyphenols. 11-22.
<https://doi.org/10.1186/s40104-020-0431-9>

**Proviox™ is only approved for use in certain geographies, end uses, and/or at certain usage levels. It is the customer's responsibility to determine, for a particular geography, that (i) the product, its use and usage levels; (ii) the customer's product and its use; and (iii) any claims made about the customer's product, all comply with applicable laws and regulations. For more information on specific products in your location, please reach out to our local Cargill animal nutrition representatives. [Contact Us](#)*

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