

## WHEN PROTEIN BECOMES A CHALLENGE

### Why look for new protein sources?

It is estimated that by 2050 the global population will exceed 9 billion people. Therefore, in order to meet the food requirements of the entire population, food production will need to increase. Consequently, more feed will also have to be produced for livestock, placing greater pressure on resources that are already limited and subject to competition between humans and animals, such as protein sources (Yu et al., 2019).

Among animal-derived proteins, pork is the second most widely consumed meat worldwide, and its consumption is expected to increase by more than 40% by 2050. The pig sector is characterized by rapid growth compared with other livestock sectors, meaning that large quantities of protein sources will be required to support this expansion (Biasato et al., 2019).

Historically, the protein sources most commonly used in pig nutrition have been soybean meal and fishmeal. However, the use of these two feed ingredients is no longer considered fully sustainable and is increasingly constrained by European regulations as well as rising prices.

Europe's protein deficit also results in high transport costs associated with imports, with consequent environmental implications. Other environmental factors related to soybean production include deforestation and the use of land and water resources. Moreover, for both soybean meal and fishmeal, the ethical issue of competition between food and feed cannot be overlooked.

In addition to its limited availability, the use of fishmeal in the feed industry is already declining and is expected to decrease further in the future (Parrini et al., 2023).

## ***Hermetia illucens*: a protein source of interest**

In this context, identifying alternative and sustainable protein sources for pig nutrition is essential.

One of the most promising alternatives in animal nutrition is insect meal, particularly meal derived from black soldier fly larvae (*Hermetia illucens*, HI).

It is characterized by a high protein content, a well-balanced amino acid profile, lipids, and other nutrients such as vitamins and minerals (Biasato et al., 2019).

The composition of insect meal varies according to the developmental stage of the insect, the substrate used for rearing, and the processing method (Sampath et al., 2025), and it may represent a valid alternative to soybean meal and fishmeal.

The use of insect meal in pigs has been evaluated in several scientific studies. Some of the main findings are summarized below.

### **What do studies on piglets show?**

In piglets during the weaning and post-weaning periods, appropriate inclusion levels of HI insect meal did not negatively affect growth performance, nutrient digestibility, blood parameters, or intestinal morphology (Biasato, 2019).

Similarly, Song et al. (2024) reported that insect meal could be included without compromising piglet growth or intestinal health, while even reducing the relative abundance of *Mycoplasma* in the ileum.

The inclusion of HI meal may also positively modulate the caecal microbiota by promoting bacteria potentially involved in short-chain fatty acid production. In addition, it appears to induce changes in small-intestinal mucin composition that are consistent with greater intestinal maturation (Biasato et al., 2020).

Thanks to the presence of lauric acid and antimicrobial peptides, insect meal may have beneficial effects on the intestinal microbiota, increasing populations of *Lactobacillus* and *Bifidobacterium* while reducing potentially pathogenic bacteria such as *Escherichia coli*.

Improvements have also been observed in intestinal barrier function and immune response. These effects may help reduce post-weaning diarrhoea and potentially decrease the need for antimicrobial treatments (Hetényi, 2026).

## **Growing and finishing pigs**

In growing and finishing pigs, replacing 50–100% of fishmeal with HI insect meal has been associated with improvements in feed conversion ratio (FCR), growth performance, and carcass traits (Chia et al., 2020).

When used as a replacement for soybean meal, HI meal has also been shown to support growth rates comparable to those observed in control groups, without negatively affecting carcass quality or the physicochemical characteristics of the meat (Hetényi, 2026).

## **What about sows?**

In sows, supplementation with 0.5–1% HI insect meal did not result in negative effects on reproductive performance.

On the contrary, supplementation showed a tendency to improve sow milk composition and contributed to supporting better piglet growth.

These findings therefore suggest that the inclusion of low levels of insect meal in sow diets may represent a potential nutritional strategy without compromising reproductive performance, while possibly having beneficial effects on milk characteristics and offspring growth.

However, other theoretical assessments suggest potential benefits related to immunostimulatory properties and the presence of lauric acid, while standardized and well-referenced field data are still lacking to define safe inclusion levels during gestation and lactation (Sampath et al., 2025; Hetényi, 2026).

The authors agree that the scientific literature currently available on targeted clinical trials involving gestating and lactating sows remains limited, as research has so far focused primarily on weaned piglets and growing-finishing pigs (Sampath et al., 2025; Hetényi, 2026).

## What are the potential benefits?

In summary, insect meal can be considered a valuable protein source that may be used as an alternative to conventional protein ingredients during different stages of the pig production cycle.

Its potential advantages include beneficial effects on intestinal health, the ability to modulate the gut microbiota, and a natural antimicrobial effect associated with its content of lauric acid and antimicrobial peptides.

At the same time, insect meal represents a potentially more sustainable alternative to conventional protein sources.

## References

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