

# A phytobiotic-based health solution to promote gut health at multiple levels

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Gut health is fundamental for the well-being of farmed fish as it supports nutrient absorption, disease prevention, and growth performance. The complex gastrointestinal tract ecosystem, consisting of the epithelium, microbiota, and immune system, works harmoniously to promote metabolism and maintain animal health. The epithelium, a protective layer lining the gut, serves as the first line of defense against harmful microorganisms and parasites while also playing a crucial role in nutrient transport, digestive enzyme secretion, and gut microbiota balance.

However, challenges in aquaculture production conditions, such as using plant ingredients in feed, high rearing densities, or suboptimal temperatures, can impair immunity and disrupt the delicate balance of the gut ecosystem. These factors can lead to chronic inflammation and compromised gut integrity, which in turn increases the risk of infections and reduces nutrient absorption. To address these negative effects, it is important to focus on nutrition strategies that emphasize gut health to prevent the entry of bacteria and parasites into extraintestinal tissues and mitigate chronic inflammation.

This article describes the role of Sanacore® GM (Adisseo) as a synergistic blend of phytobiotic extracts. One of the purposes of the application of Sanacore® GM is to strengthen gut health, resulting in better fish growth, less impact of bacterial and gut parasite infections, and overall vitality.

### **Gut health through integrity, anti-inflammatory benefits, and immunocompetence**

Gut integrity is an indicator of gut health. Transepithelial electrical resistance (TER) in the intestine of gilthead

seabream was measured to determine the integrity of the intestinal barrier. The higher the resistance value, the better gut integrity. Results revealed a 30% increase in TER of fish fed a 10% fishmeal (FM) feed supplemented with Sanacore® GM, suggesting better villi development along with stronger intestinal connections. Tighter junctions prevent harmful substances and pathogens from passing through the gut lining, leading to better overall health and growth. Gut integrity enhancement by Sanacore® GM was also measured in tilapia fed a zero-FM feed. In this species, the additive increased TER by 16%. Overall, results across species validate the efficacy of the additive to support fish gut health under challenging feed formulations, at early stages of development, or during critical periods of production.

Gut morphometry is crucial for optimal gut health in fish as it encompasses aspects such as mucosal surface area and the potential for optimal nutrient absorption. An indicator of the mucosal surface area is the ratio of the internal mucosal perimeter in relation to the external/section perimeter, the higher the mucosal surface area, the higher the internal perimeter, the higher the ratio. In the hindgut of gilthead seabream fed 10% FM feed, Sanacore® GM increased the ratio by 7%, providing a larger mucosal surface and suggesting more optimal nutrient absorption under supplementation.

Intestinal inflammation can arise from various factors, including dietary factors and infections. Inflammation can be elicited in the lamina propria, a layer of the gut epithelium hosting immune cells and supplying irrigation to the epithelium. Histopathological analysis of the different gut sections of gilthead seabream fed 10% FM feed has proved a consistent decrease in

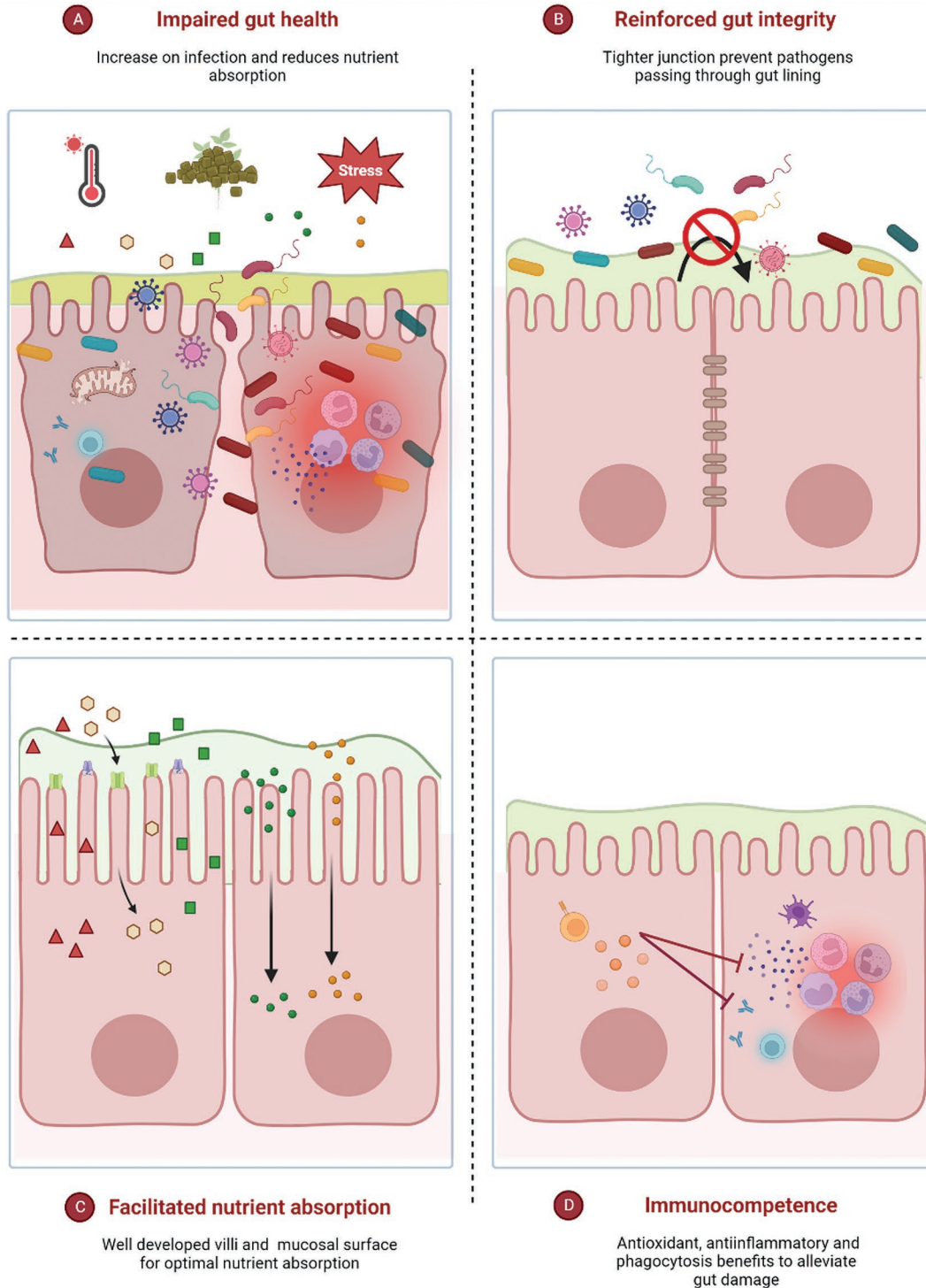


Figure 1. Schematic representation of the beneficial effects of Sanacore® GM on gut health at multiple levels. (A) Production conditions such as plant-based aquafeeds, infections, or thermal stress, can impair gut health and lead to chronic inflammation and compromised immune function. Sanacore® GM promotes gut health by (B) strengthening gut barrier integrity to prevent the entry of harmful substances and pathogens; (C) enhancing nutrient absorption through well-developed villi and mucosal surface area; (D) supporting immunocompetence by optimizing antioxidant mechanisms, phagocytosis, and anti-inflammatory response. Figure created with BioRender.com.



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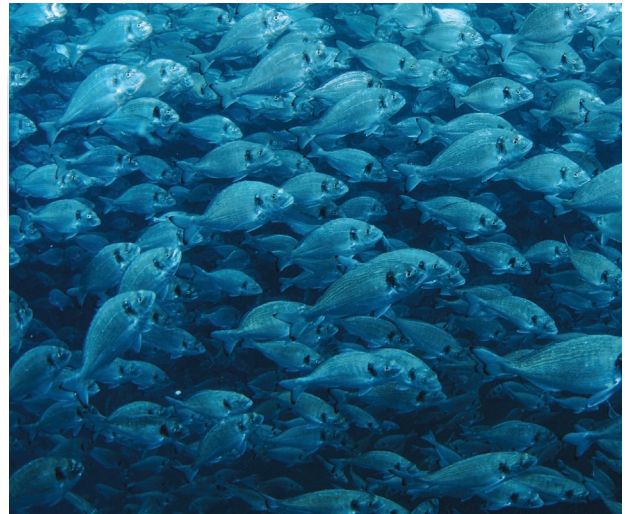
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lamina propria infiltration and thickness by 15-55%. This observation indicates that Sanacore® GM can effectively alleviate gut damage and inflammation.

The gut also plays an important role in regulating the full immune system and general health of fish. Sanacore® GM has been shown to regulate expression changes in proteins involved in intestinal antioxidant defenses as a basic pillar of optimal immunity, phagocytosis as the major innate mechanism for eliminating pathogens, and intestinal inflammatory response. These results indicate that the additive supports gut immunocompetence not only via reinforcement of physical barriers but also via active cellular and humoral responses.

### Conclusion

This article briefly describes some evidence regarding the benefits of Sanacore® GM to support gut health. Under preventive supplementation strategies, such gut health-promoting mechanisms can support fish in dealing with intensive production conditions and current aquafeed formulations and reduce the severity of parasite and bacterial infections.

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