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Commentary

Effect of Seaweed Supplements on Rabbitfish Intestinal Bacteria

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ABOUT THE STUDY

Our evolving understanding that animals and plants are 'holobionts' with equally important microbial components is enhancing our understanding of the ecology of important organisms and our ability to exploit them for food or other applications. For example, understanding how microbiomes influence the health and disease resistance of farmed fish could add significant value to the aquaculture industry for which disease is a major cost component and in many cases a bottleneck to further development.

In fish, changes in microbiomes have been linked to ageing, nutrient acquisition, immune responses, disease resistance, and general health. In turn, many environmental and biological factors can affect the diversity and structure of microbiomes within the Gastrointestinal (GI) tracts of fish. Microbiomes in fish GI tracts are highly structured with different parts housing very different microbial communities. Fish 'first feeding' is emerging as a critically important step in structuring their GI microbiomes throughout their lifespan. Microbiomes within fish GI tracts are further influenced by trophic level and associated gut morphology, with carnivores tending to have lower diversity in their intestinal microflora than herbivores and omnivores.

Aquaculture recently replaced wild fishers as the main resource of seafood globally and its importance in the provision of protein is likely to increase. One of the greatest challenges for the sustainability of aquaculture is its reliance on fish meal and oil from increasingly depleted wild fisheries and the search for alternative feeds is a very active area of global research. The use of land plant-based ingredients is one alternative, however, these novel ingredients which fish rarely encounter naturally, can create novel challenges, such as stunted growth, increased mortality and gut inflammation, especially in highly valuable carnivorous species. Furthermore, dietary supplementation with plant-based materials can reduce the microbial diversity in fish GI microbiomes.

Understanding the microbiome of Siganids and importantly, how particular diets and dietary supplements can affect it (and thus fish production and health) will facilitate the development of this new aquaculture industry. Recently fed a member of this family, *Siganus canaliculatus*, aquafeed diets supplemented with green seaweed (*Ulva pertusa*). Despite their very high inclusion rate compared to those reported for seaweed and other functional ingredients fed to higher trophic level fish, the supplementation of seaweed did not alter the diversity of microbiomes within the GI tracts of these fish. Concluded that there must be a strong core microbiome that is resistant to diet-mediated change.

The mottled rabbitfish *Siganus fuscescens* has a remarkably stable hindgut microbiome that was only subtly influenced by dietary manipulation with diverse seaweeds and selected commercial products in culture. The results of this study from captive *S. fuscescens*, plus an analysis of the microbiome from three wild *S. fuscescens* populations, indicates that a conserved core microbiome in the hindgut of this species was observable across multiple populations separated by thousands of kilometres. However, the fact that the majority of the bacteria could not be identified is also a reminder that although microbiome studies are increasingly frequent, a wide knowledge gap remains with respect to the identity and function of commensal bacteria within host-associated microbiomes.

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