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Editorial

Fish Nutrition and Physiology

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Fish account for 20% of the global population's animal protein intake. Fish are unique and rich sources of omega-3 long-chain polyunsaturated fatty acids with beneficial impacts on human health. Scientists believe that fish farming will be a more important food source in the future. High-quality feed is crucial for fish growth, health, and reproduction during farming. For a long time, the studies of fish nutrition and physiology have drawn a great deal of attention. This Special Issue has collected nine papers that focused on the nutrition of aquatic animals.

Although fish meal (FM) is the most common protein source in aquatic feeds, the decline of fishery resources will lead to a shortage of FM resources in the future. Thus, it is crucial to find low-price and high-quality protein sources to replace FM. In this Special Issue, there is a published paper reporting a bacteria protein derived from industrial-scale gas fermentation [1]. *Clostridium autoethanogenum* protein (CAP) is a new type of microbial protein produced by the fermentation of *Clostridium autoethanogenum* with carbon monoxide from steel-making waste gas [2]. Compared with traditional FM, CAP has a richer amino acid profile and contains a higher protein content, which gives it an inherent advantage as a protein ingredient. Zhang's study showed that dietary FM could be replaced by 15% CAP in feeds containing 40% FM without adversely affecting the growth of large yellow croakers and, to some extent, improving the immunity of the organism [1]. Besides, shrimp by-product (SBp) has been identified as a possible animal protein source by increasing shrimp production from captures and farms. The study showed that replacing soybean with SBp (especially 50% acid-treated) positively influenced the productive and economic performances of African Catfish (*Clarias lazera*) [3]. Plant extracts achieved a success in the aquaculture industry as dietary supplements in promoting growth and immunity. Dietary supplementation of *Moringa oleifera* leaf nanoparticles (MO-NPs) can act as a growth promoter and immune-antioxidant stimulator [4]. Moreover, hydroxytyrosol (HT), a kind of polyphenol with a small molecular weight, is the most efficient antioxidant in olives and is considered a mitochondrial nutrient. It is reported that adding HT to diets can relieve oxidative stress, apoptosis, and inflammation, likely due to its regulation of mitochondrial homeostasis [5].

Alternative lipid sources are also essential for manufacturing marine aquafeeds to replace fish oil (FO) due to the high prices and low availability of FO in the world market. Arachidonic acid (ARA, 20:4n-6) is an important LC-PUFA to bioconvert or synthesize biologically meaningful quantities of EPA and DHA. This study demonstrated the feasibility of using FO-free diets adequately supplemented with ARA in California yellowtail [6].

With the rapid development of aquaculture, people have set high standards for the quality of animal fillets. The content of free glutamate in muscle is significant to the flavor of fish meat, and glutamine is one of the most abundant amino acids in fish muscle. These studies shed new light on the regulation of enzymes in glutamate synthesis in teleost fish and provide new strategies for the formulation of high-quality feed [7,8].

Additionally, chromium oxide and NANOLIPE® are reported as good methodologies for evaluating the digestibility in larvae [9]. A preliminary attempt of artificial feed was also carried out for the endangered animal species, the Chinese sturgeon (*Acipenser sinensis*) [10].

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Taken together, this Special Issue aimed to provide insights into the high-quality feed, focused on the nutrition and physiology of fish, and suggested some approaches for future aquaculture. We anticipate that both expert scientists and readers can benefit from this Special Issue.

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