

# Effects of diet on fish health | Part 1

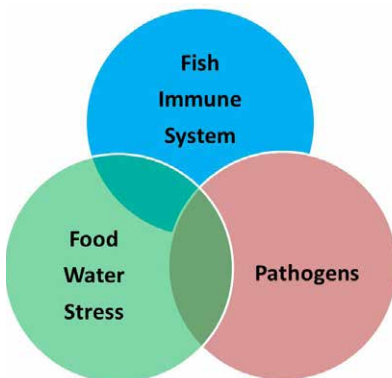
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ALL ILLUSTRATIONS  
BY THE AUTHOR

*In this and a subsequent article, I will explain what I have experienced during my 40+ years of feeding ornamental fish at wholesale level. During our daily practice in the early 90's, we had one goal: using a complete food that would provide high quality fish within three to seven days, depending on their origin and quality.*

Besides the value of the basic ingredients themselves, I have learned over the last 25 years that many other additional feed additives can play an important role in controlling the health of our fish: to help their immune (defense) system, to assist in faster repair after damage, to prevent or control infections, etc. In general, following recent studies and my own experience (especially in aquaculture) I've learned to understand the health benefits of a functional fish food, i.e., a food that provides more benefits than just 'feeding fish'; in other words, a food that can be seen as 'nutritional medication', with products from nature, and avoiding the use of actual medications.

As Hippocrates said 2,000 years ago: *'Let food be thy medicine and medicine be thy food'*



*The relationship between the major factors which influence health.*

## Making food 'different'

The main raw ingredient I recommend in the production of food is fresh wild Scandinavian fish (herring, mackerel, anchovy) which are very rich in proteins and essential Omega-3 DHA fatty acids. Besides, this food also contains fresh mollusks and crustaceans, such as squid, octopus, shrimps, prawns and krill, as well as fish oils, cereals, yeasts and algae.

In general, the composition of a food for most of our aquarium fish (both freshwater and marine) is ideal when it contains a high percentage of digestible proteins, many essential amino and fatty acids, vitamins A+B+C+D, trace elements and minerals. In this article, I will not go into detail about the function of each essential food molecule. (As reference, you can refer to: *Nutrition and Fish Health* by Lim & Webster)

It is more important for me to share my experience as a fish health specialist. During my many years of work in four continents as fish pathobiologist, I have not only looked at feeding fish with



*Fresh wild fish are very rich in nutrients.*

good ingredients, but also at adding extra health beneficial natural products to make the food 'functional'.

I have also given significant preference to granulate (pelleted) food. When granulated food is produced, the majority of ingredients are mixed and then cold-pressed. It is then cooked for a very short time at only 70°C to eliminate viruses and bacteria. Once the food is cold, but still a little humid, the vitamins and nutrients (such as algae, immuno-stimulants, açai, herbs, aloe vera, garlic, etc.) are added so that none of their exceptional nutritional values are lost.

Equally, it is of the utmost importance that a food has enhanced palatability, since many fish come from specific breeding facilities, or from the wild, and need to learn to eat a new kind of food. A great deal of attention is therefore paid (especially by using wild fish) to ensure that the fish 'smell/taste' the granulates very quickly.

Through my experience with millions of fish I have learned to understand the problems that the large variety of our ornamental fish encounter in our industry: handling, packing, shipping, acclimation, netting, mixing of species, competition and many other stress factors.

Next to the selection of good quality fish and shrimp, which are mostly Scandinavian in origin, the addition of extra natural products (to produce functional feed or nutrients) helps in the prevention of bacterial, viral, fungal and parasitic infections, or enhance faster repair/recovery after disease.

At the same time, it's important to try to optimize digestive and metabolic efficiency: less waste (less pollution of the aquarium water) and better growth and coloration of the fish.

The investment in good food contributes to fewer problems with fish, fewer diseases, less use of medications (especially antibiotics), less work, lower costs, etc., AND higher quality of fish and higher survival rates. In the fish business, this means more profit! From my personal experience, I have seen companies going out of business because they never wanted to invest in food, but spent lots of money on medications, water changes, excessive working hours, combined with high losses and complaints (DOA's) from customers. Of course, this results in no profit.

### Functional fish food and health

Wikipedia describes 'functional food' as "a food given an additional function (often one related to health-promotion or disease prevention) by adding new ingredients or more of existing ingredients".

This has become an important issue in 21st Century because the use of antibiotics and other medications will eventually become very much restricted.

Functional fish food can be produced by coating natural products around each granulate after its production so that the quality of beneficial ingredients is guaranteed. These natural products have a functional purpose with regard to health benefits for the fish, and fall under different categories: probiotics, prebiotics and phytotherapeutics.

■ **Probiotics:** "Probiotics are microorganisms which are believed to provide health benefits when consumed." (Ref. Wikipedia)

I recommend the use of *Pediococcus acidilactici*, since it has been proven to have a great effect on the health and growth of fish. (Reference Nobel prize laureate, Élie Metchnikoff, the beneficial effect of yoghurt (!) and, in recent years, human consumption of 'Yakult'.)

The beneficial bacteria are mixed in the coating around each granulate during the production process and are introduced into the fish via the food, as a result of which they change the content of the intestinal flora in a very positive way. The intestinal flora have a great impact on the resistance against infections: weak gut flora create a weak defense against infections (the same goes for all

### Testing center for professional fish feed



animals and humans). Since 2014, many positive scientific reports have been published on this subject.

Probiotics can be incorporated in a wide range of food and can be fed permanently.

■ **Prebiotics:** "Prebiotics are substances that induce the growth or activity of microorganisms (e.g., bacteria and fungi) that contribute to the wellbeing of their host. The most common example is in the gastrointestinal tract, where prebiotics can alter the composition of organisms in the gut microbiome. However, in principle it is a more general term that can refer to other areas of the body as well. As a functional food component, prebiotics, like probiotics, are conceptually intermediate between foods and drugs". (Ref. Wikipedia)

Yeast extracts (from *Saccharomyces cerevisiae*) are very commonly used in aquaculture and our industry. They contain a high concentration of Beta-glucan, which is as effective in all mammals as it is in fish and birds, with its immuno-enhancing properties established in a number of fish species. It has applications for prophylactic (preventive) and therapeutic use.

Beta-glucan may be used as an alternative to antibiotics and vaccines for protecting farmed fish against microorganisms, or microparasitic disease. It can also be used together with vaccines to improve their effectiveness and it is non-toxic to fish. Beta-glucan products have been in practical use for many years in animal feeds all over the world to improve the health of aquaculture species, pets and farm animals. Pretreatment definitely increases survival rates, with enhanced phagocytic (disease-consuming) function and the inhibition of cellular injury.

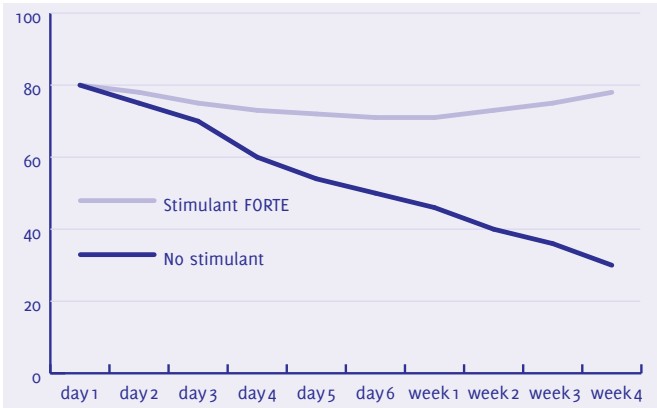
An overall enhancement of the immune response can be achieved by the use of Beta-glucan. This may, in turn, allow fish the opportunity to combat disease effectively. Using Beta-glucan as a dietary supplement carries the potential to impact the quality of health significantly, as well as enhance longevity.

At the same time, bioflavonoids and vitamin C from citrus fruit provide anti-oxidant and anti-inflammatory activity, especially in the intestine. This works synergetically with the glucan.

I recommend this kind of immuno-stimulant food during acclimation, before shipping, after unpacking, after stressful situations and during disease/treatment (fish should be fed during treatment).

■ **Phytotherapeutics or Phytotherapy:** "Phytotherapy is the use of plants and plant extracts for attempted therapeutic purposes". (Ref. Wikipedia)

In my experience, based on trial and error working with millions of fish over the years, and via the exchange of data with experts in the aquaculture,



Level of immunity with or without the use of an immunostimulant during stress

I have used many different kinds of plant (phyto) materials in food. We cannot regard them as medicines, but more as 'aids' during treatment, or for faster repair/recovery after disease.

Here's a brief overview:

**Chlorella:** at 5% - from the freshwater alga, *Chlorella pyrenoidosa* - for all fish, including livebearers. Also mixed in with very fine food, it is perfect for the growth of baby fish.

**Garlic:** at 2% - from *Allium sativum* - for improved palatability and as an aid for anti-microbial and anti-parasitic control in the gut.

**Combination:** 5% *Chlorella pyrenoidosa* (see above) + 5% *Moringa oliveira* - benefits herbivorous or algae-eating fish, such Loricariidae, Malawi and Tanganyika cichlids.

**GSE/Moringa:** 5% Grapefruit Seed Extract (=disinfectant) + 5% *Moringa oliveira* (=repair) - during or after bacterial infections, especially intestinal ones.

**Aloe:** 2% *Aloe vera* - improves repair during and after a bacterial infections.

**Herbal:** 2% *Thymus* (thyme) + 2% *Mentha* (peppermint) + 2% *Artemisia* (mugwort) + 2% *Stellaris* (chickweed) - commonly used in aquaculture as an aid when fighting viral or bacterial infections.

**Açaí:** 1% concentrate of fruit berries from *Euterpe oleracea* (palm tree), a kind of redberry that strengthens fish when weak, when they need more color, or as a reproductive stimulant for breeding pairs. Much used among discus and cichlid keepers.

**Matrine:** 0.2%, ingredient from *Sophora flavescens* - helps fish to protect themselves against White Spot or ICH infection (freshwater and marine) by influencing the content of the mucus. A great help for prevention, during treatment and for reef aquaria. ■

PART 2 of this article will appear in Issue 85 of the *OFI Journal*.  
PART 2 will also include several References.

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