## Improve growth rate
## Manage gut health

# Aquaculture

**Innovative Functional Solutions**
**Designed to Improve Health and Productivity**

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# Aquaculture

## Innovative Functional Solutions Designed to Improve Health and Productivity

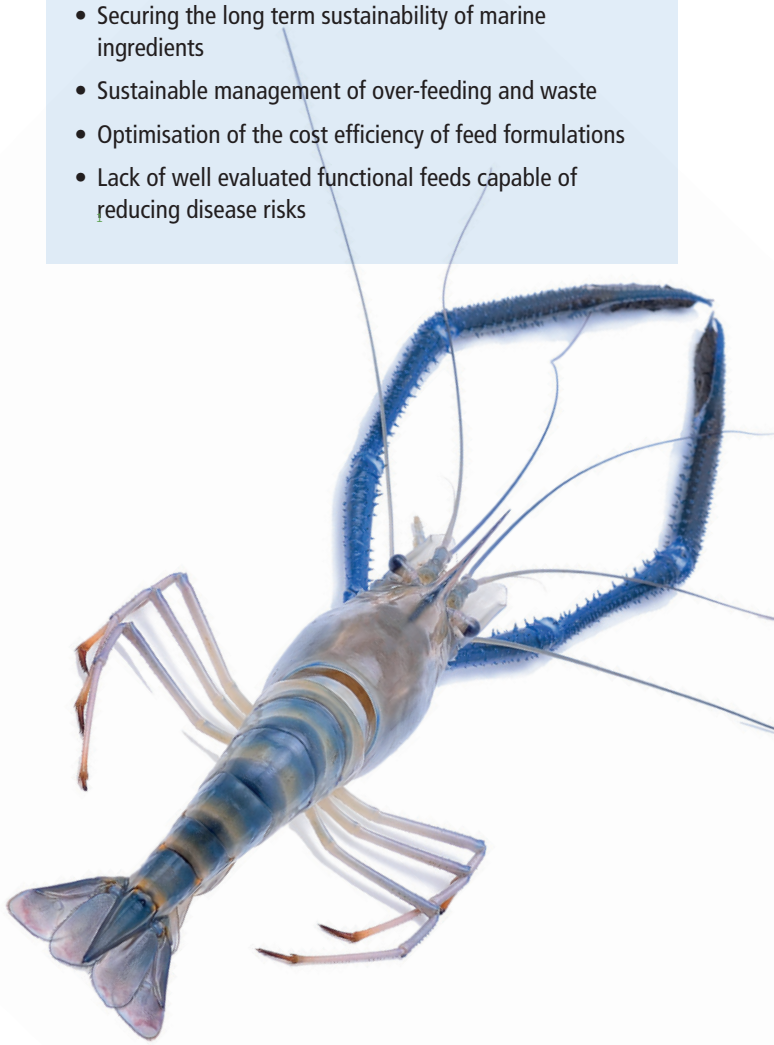
**Aquaculture is fast growing with more than double digit growth annually as a result of increased fish consumption and new trends for healthier food. At the same time natural resources of wild fishing are tightly regulated and aquaculture is now the main source of fish and shellfish in most parts of the globe.**

The high demand for fish meal and fish oil by aquaculture has resulted in scarce supply and an increased feed cost. However, a concomitant increase of knowledge in aqua nutrition in the recent years combined with better understanding of the fish metabolism has resulted in substantial improvement of the feed efficacy. Salmon is the lead example of the aqua industry achieving FCR rates of +/- 1/kg of meat produced.

Further progress in aquaculture relies on advancing specific nutritional and technological requirements in feed formulation.

### The main challenges are:

- Limited knowledge of the detailed nutritional requirements per aqua species
- The complexity of the landscape due to the wide diversity of species and farming conditions
- Securing the long term sustainability of marine ingredients
- Sustainable management of over-feeding and waste
- Optimisation of the cost efficiency of feed formulations
- Lack of well evaluated functional feeds capable of reducing disease risks



## Aquaculture – (crustaceans) Shrimp

The field is facing a constant pressure for more cost effective and efficient production. This is combined with the industry's standard practice, the shallow pond system, where substantial amount of **toxins** either via nutritional or environmental inputs such as the pond water itself result in an increased risk of chemical and **mycotoxin contamination**. This may impact negatively the health and performance of crustaceans as it often translates in low growth rates and high mortality. A good mycotoxin prevention and protection strategy is thus highly recommended.

At the same time aquaculture is the leader in **antibiotic use** within production. However, due to legislation and export controls antibiotic use is being restricted more and more. Therefore, it is critical to develop **cost effective antibiotic alternative strategies** to ensure the long-term sustainability of shrimp production.

**Prevention and control of disease** are now high priorities in the shrimp aquaculture in the vast majority of shrimp producing countries. Several bacteria are constantly threatening the digestive system of the shrimp and can have a negative impact on their growth. Therefore, **optimal gut health management** is central to ensuring the best performance.

As such **enhancement of the shrimp's immune system** is key to establishing alternative strategies for disease control. Immune modulators such as nucleotides and mannan-oligosaccharides have been widely recognized as promising supplements that can potentially aid disease prevention in farmed aquatic species. These substances appear to increase disease resistance by regulating the host defense mechanisms against opportunistic pathogens present in the surrounding environment.

However, the **future sustainability** of the shrimp aquaculture also depends on the selection of disease-resistant animals, making thus parallel research in immunology and genetics essential.

## Aquaculture – Marine Fish

**The global fishery and aquaculture industries face several long-term challenges for sustainable growth such as:**

- Ensuring **good quality feed**
- Coping with environmental disease challanges such as gill parasitic infections
- Minimizing the environmental impacts from the ever-increasing water temperature
- Replacing of fish meal and fish oil
- Improving nutrient efficiency, due to the high need to replace marine and animal ingredients with vegetable sources
- Improving fish health and survivability

**Disease caused by infections and microorganisms** is widely accepted as one of the major constraints in the aquaculture industry since marine fish are susceptible to disease regardless of their nutritional status. Feeds with **antibiotics** are commonly used to treat disease. However, sick fish tend to reduce their eating significantly and therefore antibiotic usage is of limited value. The widespread use of antibiotics in aquaculture is also of great concern due to rise in antibiotic resistance.

Therefore, **antibiotic reduction** is of utmost importance to the industry.

**Innovad®'s research has developed unique solutions that improve growth, increase feed efficiency and enhance health status by mitigating stress and disease without medication.**

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Mycotoxin & Stress Control

## Escent®

**Mycotoxin and stress control**

### The unique challenge

The widespread use of plant raw material alternatives in aquaculture species is hindered by decreased metabolism. At the same time the use of low quality oils and fats for increased feed energy density results in oxidation and formation of free radicals that negatively impact the animal's health status and performance.

## Escent®: the solution

Thanks to years of research Innovad® has developed **Escent®**, a unique formula which helps aqua producers to control ammonia levels and other poisonous residues that accumulate within production ponds.

### The main actions of Escent® include:

1. **Preventing Oxidative stress:** with selected protective antioxidants providing cellular support on tissues, cells and the intestinal microbiota against the damaging effects of free radicals
2. **Reducing immune suppression & strengthening the animal's natural immune response:** with the use of selected plant extracts and specific, biological response modifiers
3. **Liver support** with selected plant extracts against toxic stressors
4. **Biotransformation of produced toxins** rendering them into less harmful/polar molecules that can be easily excreted by the organism
5. **Binding & Adsorption.** By capturing the water soluble (polar) toxins and reducing their bioavailability. Both with highly adsorbent mineral clays and yeast extracts rich in gluco-mannans.

Customer Testimonial, Vietnam:

***'Important reduction in mortality and improved feed consumption in really challenging conditions'.***

A clear demonstration of the impact of **Escent® L** on the health status of aqua species.

**Escent® L** has been proven to help catfish and tiger shrimp producers to eliminate and prevent white spot disease and gangrene.


Intestinal Health & Medication Control

## Lumance®

**Gut health**
**Antibiotic replacement**

**Lumance®** offers a comprehensive intestinal health management program that achieves growth promotion with concomitant medication reduction by regulating beneficially the microbiota of the lumen and strengthening the intestinal integrity of the epithelium.

**Lumance®** is a proprietary complex technology which incorporates:

- The newest generation of butyrate for slow and targeted release
- Protection technologies which ensure that:
  - Organic Acids
  - Medium-chain fatty acids
  - Essential oils
  - Anti-inflammatory compounds and polyphenols

  are delivered actively in the intestinal tract for powerful and effective antibacterial control.

**Lumance®** improves fish health by reinforcing the intestinal integrity, reducing the inflammatory response, balancing the intestinal microbiota and protecting against reactive oxygen species without the need for medication.

Antibacterials & Digestive Aid

## Lysomax®

**Digestive aid**
**Source of lyso-phospholipids (bio surfactant)**

Crustaceans and fish cannot adequately synthesize the phospholipids they require for maximum performance. Therefore, Lysolecithin phospholipids need to be added to their diet.

Enzymatically hydrolyzed lecithin is an excellent natural source of dietary phospholipids. Progressive fish feeds contain lower levels of fishery by-products and higher levels of more economical agricultural commodities. However, most economical protein and lipid sources (soybean meal, corn gluten meal, canola meal, meat and bone meal, feather meal, and animal fats) have been associated with decreased lipid absorption and increased fat accumulation in the carcass.

Thanks to its hydrophilic – lipophilic properties **Lysomax®** improves fat digestion and optimises the energy content of aqua diets.


Antibacterials & Digestive Aid

## Novigest

**Fish meal replacement**
**Vegetable protein digestion aid**

The supply of fish meal protein has decreased dramatically in the recent years. As a consequence, the price of fish meal has risen significantly, making it impossible for aqua producers to sustain economically viable aquacultures. To avert ecological harm and high costs, fish meal has been largely replaced by vegetable and animal protein.

Plant based materials (soybeans, sunflower, tapioca etc.) are currently used extensively as fish meal replacements, however fish and crustaceans are lacking the necessary precursors in their system to adequately digest vegetable proteins and other essential nutrients.

**Novigest** is an excellent aid for optimal nutrient digestion of alternative proteins thanks to its functional ingredients.

**Novigest** is supplementing cholic acid and other bile salts which are physiologically absent in aqua species. **Novigest** can thus effectively address the supply of essential amino acids such as taurine and inositol in vegetable protein sources used in modern aquacultures.

# Aquaculture

**Innovative Functional Solutions Designed to Improve Health and Productivity**

**Intestinal Health & Medication Control**

## Novinat® FF

**Protection from pathogens**

Parasites are a key issue in global aquaculture practices and can detrimentally affect their productivity, sustainability and profitability. Strict control measures and appropriate protection are imperative to secure a healthy aquaculture.

Farmers and feed producers are continuously searching for ways to improve feed performance and optimize production in order to maintain profitability.

**Novinat® FF** is a combination of essential oils and flavoring components, designed to improve fish and shrimp health and performance.

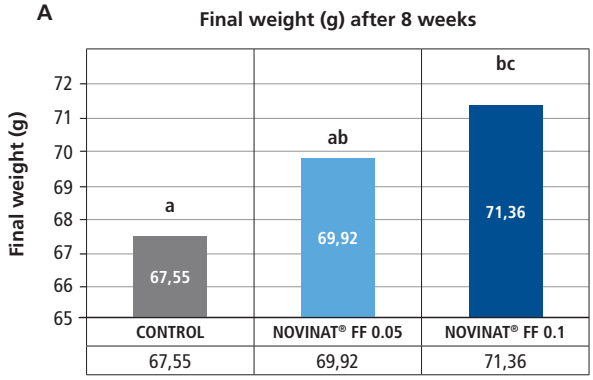

## Trial 1:

**In vivo trial of Novinat® FF in Tra catfish: Vietnam**

Effects of **Novinat® FF** on growth performance and enhancement of disease resistance to the natural occurrence of the gill monogenean parasite in Tra catfish.

Impact of different doses of **Novinat® FF** on Tra catfish fish in terms of

**A)** growth, expressed as final weight (g) and,




**B)** Mean intensity of infection, expressed as a product of the average number of Monogeneans recorded in a defined area under the microscope (n=5 replicates per treatment).

| B | TREATMENT | | |
|---|---|---|---|
| | CONTROL | NOVINAT® FF 0.05 | NOVINAT® FF 0.1 |
| 0 | 8.13 ± 1.81[a] | 9.21 ± 0.74[a] | 6.93 ± 2.12[a] |
| 1 | 6.00 ± 1.93[a] | 4.20 ± 0.40[a] | 5.27 ± 2.25[a] |
| 2 | 9.40 ± 2.31[a] | 5.67 ± 1.78[a] | 3.53 ± 0.31[b] |
| 3 | 3.60 ± 0.20[a] | 2.93 ± 0.50[b] | 1.60 ± 0.34[b] |
| 4 | 4.80 ± 0.69[a] | 3.80 ± 0.35[a] | 2.47 ± 0.46[b] |
| 5 | 4.20 ± 0.72[a] | 3.00 ± 0.20[b] | 1.80 ± 0.20[c] |
| 6 | 3.07 ± 0.31[a] | 2.13 ± 0.12[a] | 1.60 ± 0.34[b] |
| 7 | 2.87 ± 0.31[a] | 2.07 ± 0.12[b] | 1.20 ± 0.20[c] |
| 8 | 3.60 ± 0.35[a] | 2.40 ± 0.31[b] | 1.47 ± 0.12[c] |

*Values in the same line with different letters denote statistically significant differences ($p<0.05$)*

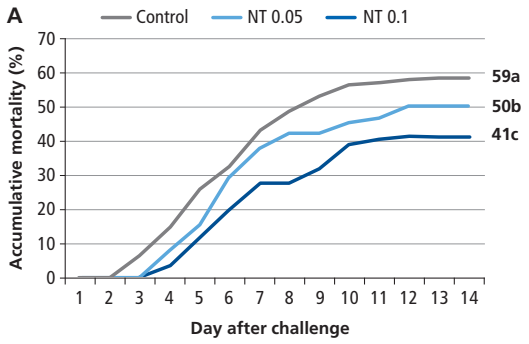
### Trial 1 - Conclusions:

Supplementation of Tra catfish with **Novinat® FF** enhanced:

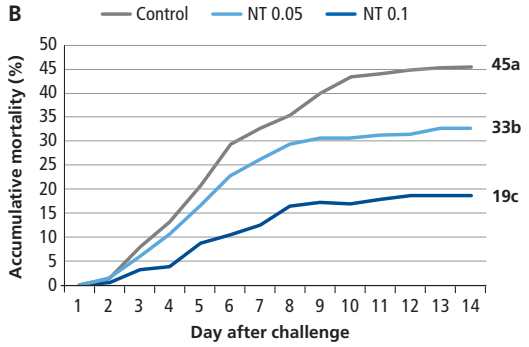
- **The growth performance and,**
- **The disease resistance to natural occurrence of gill monogenean parasites in a dose response manner when compared to the Control treatment**

## Trial 2:

Effects of **Novinat® FF** on enhancement of disease resistance to challenged Tra catfish with **A)** *Edwardsiella ictaluri* and **B)** *Aeromonas hydrophila.*




Accumulative mortality (%) of Tra cat fish two weeks post challenge with *E. ictaluri*




Accumulative mortality (%) of Tra cat fish two weeks post challenge with *A. hydrophila*

*Different letters (**a**, **b**, **c**) indicate statistically significant differences between treatments (p<0.05)*

**Number of infected fish per treatment**

| Bacterium | No. of fish checked | No. of infected fish per challenge | | |
|---|---|---|---|---|
| | | CONTROL | NOVINAT® FF 0.05 | NOVINAT® FF 0.01 |
| *E. ictaluri* | 15 | 6 | 0 | 0 |
| *A. hydrophila* | 15 | 2 | 0 | 0 |

### Trial 2 - Conclusions:

Supplementation with **Novinat® FF**

- **Reduced significantly the mortality caused by the challenge both with *E. ictaluri* and *A. hydrophila***
- **Eliminated completely infectivity in a sample pool of 15 fish per Novinat® FF treated group**

# Novinox® FPM

## Antioxidant activity

Aqua feed is highly susceptible to oxidation, due to the nature of highly unsaturated and Omega 3 fatty acids.

Continuous supply of powerful antioxidant ingredients is crucial.

**Novinox® FPM is a blend of highly potent antioxidant ingredients especially designed to replace synthetic Ethoxyquin.**

A well balanced, synergistic and highly concentrated antioxidant combination for the protection of animal feedstuffs against autoxidation. **Novinox® FPM** is a synergistic antioxidant system of BHT and BHA, reinforced with chelating agents such as citric acid.

**Novinox® FPM**
A **natural antioxidant** combination based on Tocopherols and Rosemary extract is also available upon request.

# Aquaculture

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## Novitech / Nucleomax

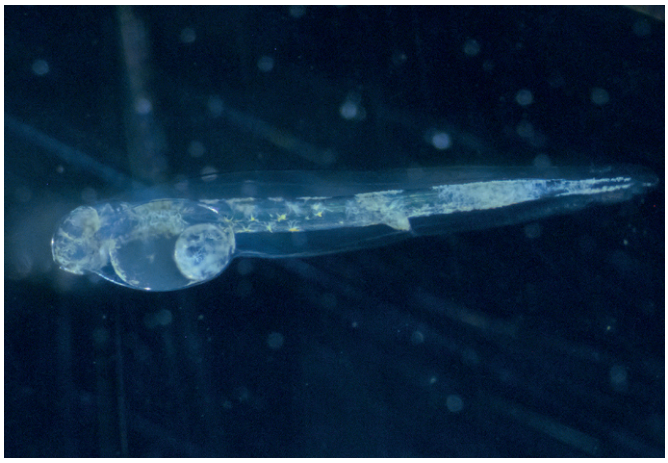
### Immunity & health balance

Demand for increased production, sourcing of plant based alternative ingredients, along with lack of advances in genetics compared to other farm species put tremendous pressure in aquaculture.

The industrial aqua production is customized in enhancing the supply of the necessary vitamins, amino acids and Omega 3 / Omega 6 fatty acids to early fish juveniles in order to improve survivability.

**The move of fish larvae to fish growing ponds is a critical phase. Protection of the young fish against pathogens and enhancement of their immune system is key**. Immune enhancers can be either hydrolyzed cell wall of yeast or highly potent and functionally available nucleic acids and nucleotides.

Baby white shrimp



Seabass larvae

**Novitech** utilises the antimicrobial activity of selective organic acids chosen for their synergistic effect against pathogens.
This is complemented by key components of yeast cell walls such as beta-glucans and mannan-oligosaccharides which enhance reactivity of the non-specific immune function.

**Nucleomax** is a specifically designed highly available source of ribonucleic acid for enhanced immunity in aquaculture.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