Benefits of applying Sanolife Probiotics to larval fish rearing tanks
Application of probiotics is not a stand alone solution in any kind of aquaculture operation. It must be part of an adequate health management system at the farm.
INVE Aquaculture has developed a product range covering all aspects of good health management.

Control of pathogen (reducing or killing pathogens)

Support environment (tank bottom and water quality)

Support animal (metabolism, support immune system)
INVE Aquaculture’s health management solutions for fish hatcheries

- **disinfectant** for aquaculture applied to the water to control pathogens
- **Green Water Conditioner** for larval fish tanks eliminating the use of live algae
- **microbial mixture** applied to the water in shrimp, fish and live food tanks to maintain water quality and optimize the gut micro flora
Sanolife Probiotics

highly concentrated probiotic mixes for ongrowing shrimp and fish

Applied to the larval tank
Active in the water and the gut of the larvae
Inhibiting pathogens
Supporting food digestion
Recycling waste ion nutrients
resulting in higher survival, better growth and lower FCR
Are true probiotics

Selected for Performance, safety, Ease of Use and Consistency

Only especially selected Bacillus strains are used
Naturally present in aquatic environments and shrimp and fish

The “B. subtilis” group (Bacillus subtilis, B. licheniformis, B. pumilus, B. amyloliquifaciens, B. lentus) is generally safe (SCAN committee) but toxin genes have been found in a few strains of other Bacillus species. Checks must be made for cytotoxicity and/or presence of toxin genes.

With appropriately selected strains: no toxicity towards fish or shrimp, even at dosages >100 times the recommended dose.
Bacillus form spores

Bacillus spores have a long shelflife
Bacillus form spores

- Individually produced spores of different Bacillus strains can be mixed in the correct ratio every time
  - Consistent product!
- High spore-counts can be reached
  - Very effective at low dosages!
- Spores can be applied directly to the water
  - No need for brewing!
  - Not necessary to germinate
Sanolife Probiotics Perform

- Selection of specific B. strains that are to be able to grow and perform in a wide range of aquaculture environments
  - ✓ Temperature: 20°C - 45°C
  - ✓ Salinity: 0 - 60 ppt
  - ✓ pH: 5 - 10
  - ✓ (an)-oxic conditions
Active against many pathogens

- Directly by growth inhibition and indirectly by competitive exclusion
Active against many pathogens

Inhibition of *Streptococcus iniae* strains by the 5 Sanolife *Bacillus* strains (Bac 1-5)

<table>
<thead>
<tr>
<th>Code</th>
<th>Source</th>
<th>Bac 1</th>
<th>Bac 2</th>
<th>Bac 3</th>
<th>Bac 4</th>
<th>Bac 5</th>
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<tbody>
<tr>
<td>QMA0083</td>
<td><em>L. calcarifer</em>, Australia</td>
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<td>2</td>
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<td>QMA0177</td>
<td><em>L. calcarifer</em>, Australia</td>
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<td>4</td>
<td>1</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>QMA0165</td>
<td><em>L. calcarifer</em>, Australia</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>2</td>
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<tr>
<td>QMA0186</td>
<td><em>O. mykiss</em>, Israel</td>
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<td>3</td>
<td>0</td>
<td>5</td>
<td>2</td>
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<tr>
<td>QMA0187</td>
<td><em>Channa striata</em>, Thailand</td>
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<td>2</td>
<td>2</td>
<td>5</td>
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<tr>
<td>QMA0188</td>
<td><em>O. mykiss</em>, Israel, Israel</td>
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<td>QMA0189</td>
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<td>2</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 1. Performance of selected *Bacillus* strains against *S. iniae* strains. Levels of inhibition: 0= no inhibition; 1=1-5mm inhibition zone; 2=6-10mm inhibition zone; 3= 11-20mm inhibition zone; 4=>21mm inhibition zone; 5=>21mm after 24hr incubation, and 11-20mm without pre-incubation.
Active against many pathogens

<table>
<thead>
<tr>
<th>Fish species</th>
<th>Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese flounder ((Paralichthys olivaceus))</td>
<td>Vibrio spp.</td>
</tr>
<tr>
<td>Gizzard shad ((Konosirus punctatus))</td>
<td>Vibrio sp.</td>
</tr>
<tr>
<td>Gilthead seabream ((Sparus aurata))</td>
<td>Vibrio harveyi</td>
</tr>
<tr>
<td></td>
<td>Vibrio proteolyticus</td>
</tr>
<tr>
<td>Rainbow trout ((Salmo gairdneri))</td>
<td>Vibrio spp.</td>
</tr>
<tr>
<td>Herring ((Clupea harengus))</td>
<td>Listonella anguillarum</td>
</tr>
<tr>
<td>European seabass ((Dicentrarchus labrax))</td>
<td>Photobacterium illipiscarum</td>
</tr>
<tr>
<td>Turbot ((Scophthalmus maximus))</td>
<td>Vibrio spp.</td>
</tr>
<tr>
<td>Pacific cod ((Gadus macrocephalus))</td>
<td>Vibrio logei</td>
</tr>
<tr>
<td>Atlantic salmon ((Salmo salar))</td>
<td>Vibrio fortis</td>
</tr>
<tr>
<td>Coho salmon ((Oncorhynchus kisutch))</td>
<td>Vibrio ordali</td>
</tr>
<tr>
<td>Croaker ((Micropogon opercularis))</td>
<td>Vibrio sp.</td>
</tr>
<tr>
<td>Tilapia ((Oreochromis niloticus))</td>
<td>Streptococcus spp.</td>
</tr>
<tr>
<td>Channel catfish ((Ictalurus punctatus))</td>
<td>Edwardsiella sp.</td>
</tr>
</tbody>
</table>
Survive in the fish intestinal tracts:

- Produce enzymes that improves feed digestion:
  - faster weaning.
  - shorter broken up feces.
  - Rapid breakdown of the feces on the tank bottom
- Displace and inhibit pathogenic bacteria: leading to higher survivals
Sanolife Probiotics Perform

- Waste management
  - Water and tank bottom quality improves
  - Less stress for the animals
  - Survival and growth
  - Possibility to reduce water change
Sanolife Probiotics  How to deliver

- Can be applied directly to the water
- Can be applied through enrichment of the live food
- Can be coated on the fish feed
Sanolife Probiotics Conclusion

- Are selected for performance in an aquaculture environment
- Must be part of a good health management system
- Reduce chance on or effect of disease outbreaks
- Improve weaning and growth
- Improve water quality