

leaders in biosecurity

Virkon^S
for aquaculture

ANTEC[®] Virkon^S for Aquaculture

Reducing pathogen
challenge in the
aquatic environment
for fish production



DuPont Animal Health Solutions

ANTEC[®] BIOSENTRY[®]

DU PONT The miracles of science[™]

How fish diseases are spread

The greatest threat to the health of fish is the transfer of an infective dose of virus or bacteria from another fish, perhaps via the incoming water or the water system of the tank or raceway.

Vaccination is important, medication can be used after a clinical infection has arisen, and proper biosecurity will greatly reduce the risk of introduction of pathogens with vehicles, personnel, equipment or nets. None of these however can address the problem of viruses and bacteria in the water itself.

With an exceptional safety profile, Virkon®S for Aquaculture is the ultimate fish disinfectant, independently proven to be highly effective against significant fish pathogens.

Recent work at the University of Idaho and on commercial salmonid farms has shown that it may also play a valuable role in water environment biosecurity.

Reducing pathogen challenge in the environment

Aerial fogging (nebulization) with low levels of Virkon®S has long been utilised in pig and other livestock husbandry to help reduce aerial pathogen challenge in the environment.

Similarly, the introduction of low levels of Virkon®S for Aquaculture on a continuous basis into the header tank of salmonid hatcheries has recently been shown to significantly control the spread of fish virus and bacterial particles in the water environment.

Even at three times the recommended application rate of 2ppm after the first feeding, long term exposure studies have shown there to be no effect on the growth, feeding or condition factor of the fish under such conditions.

Virkon®S for Aquaculture breaks down rapidly and has low environmental toxicity. Discharge consents need to be issued for effluent discharge by the relevant environment agency;

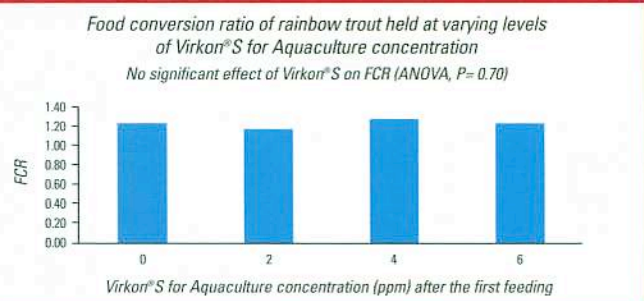
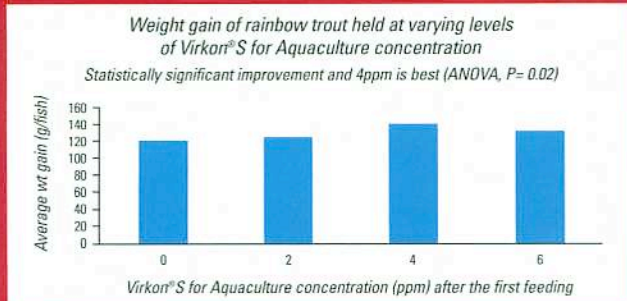
- England & Wales - the Environment Agency
- Northern Ireland - the Environment and Heritage Service
- Scotland - the Scottish Environment Protection Agency

Favourable, independent data may be supplied on request to support applications for discharge consents to the relevant environment agency.

Effluents are also significantly improved in terms of pathogen status, resulting in overall reduction in pathogen load in the surrounding environment.

Virkon®S for Aquaculture: independently proven safety

Recent studies by Professor R.W Hardy and his colleagues at the University of Idaho Aquaculture Research Institute have shown that continuous exposure to Virkon®S for Aquaculture at 2 ppm from hatching to at least 90 days (the period of the study) showed no chronic toxicity effects following clinical and histo-pathological study. Additionally no negative impact on weight gain or FCR was noted.



Figures 1 & 2 Growth rates of rainbow trout fry on different levels of Virkon®S for Aquaculture for demonstrating no negative impact on growth or FCR. Acute toxicity is seen at 6 ppm at first feeding rising to 25 ppm at parr stage providing a high safety margin.

Virkon®S for Aquaculture: beneficial effect of reducing pathogen challenge for fish production

Studies in Chile, USA and Scotland show that using the unique approach to reducing pathogen challenge has a major beneficial impact. In high risk situations, for example where there has been a history of disease, this approach reduces the risk of subsequent outbreaks.

As an example, one large commercial Atlantic salmon hatchery, with a history of high mortality of IPN the previous year, started applying Virkon®S for Aquaculture at 2 ppm immediately the condition recurred, in the first crop of new fry. Clinical, pathological and IPN viral isolation studies demonstrated that prior to the application the pathogen challenge was identical to that of the previous year. The subsequent drop in mortalities compared with the previous year is therefore extremely significant.

- First crop (2002 - red, figure 3) without Virkon®S for Aquaculture application to the water environment: Mortality 69%.
- Second crop (2003 - blue, figure 3) with Virkon®S for Aquaculture introduced to the header tank within 72 hours of first clinical losses from the same strain of IPN: Mortality less than 4%. In this case the Virkon®S for Aquaculture was introduced into the header tank continuously at 2 ppm over 90 days.

The IPN virus is widely recognised as being one of the most difficult aquatic pathogens to destroy. This approach

should also help to reduce the challenge from IHN, VHS and SVC viral and flavobacteria pathogens. Virkon®S for Aquaculture is not a medicine. Mortalities are reduced by reducing the build up of pathogen in the water. Application should begin after first feeding and where possible, before any disease is evident. Once an outbreak has begun and very high levels of pathogen in the water already exist, losses can be high among fish already infected and the situation can take longer to come into control, since Virkon®S for Aquaculture does not act on the fish, but on the virus or bacteria in the water environment.

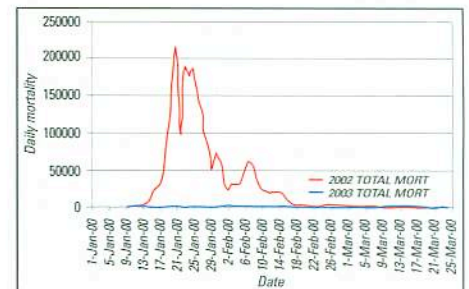


Figure 3 Daily mortalities in two crops of salmon fry in same hatchery with similar IPN virus pathogen challenge.

Virkon®S for Aquaculture: Application guide

- Since Virkon®S for Aquaculture has no residual or medicinal effect in fish and only exerts its biocidal effect in the water environment, it is used on a continuous low level dosage basis supplied into the water as it enters the header tank of the facility.
- The UK Veterinary Medicines Directorate has determined this application is not a veterinary medicine and thus does not require a UK marketing authorisation. To ensure full regulatory compliance in your country please read the label carefully and contact DuPont Animal Health Solutions should further guidance be needed.
- An accurate pump such as a peristaltic pump is required to ensure consistent dosing of the incoming water.
- Virkon®S for Aquaculture should be applied at 2ppm (1:500,000) on a continuous basis from the first feeding for at least 8 weeks. Application should cease by 6 months of age.
- Acute and chronic toxicity studies have shown that for Atlantic salmon and rainbow trout, this procedure has a wide safety margin, at all stages of the life cycle after the first feeding. Further data will be supplied on request.
- It is recommended that a trial run be carried out on any new pumping arrangement before exposing significant numbers of fish stocks and that particular care is taken with eggs and first feeding stages.

Instructions

How to make a 2 ppm solution of Virkon®S for Aquaculture

Make up a 1:100 (1%) stock solution of Virkon®S for Aquaculture in a tank adjacent to the water supply header tank. Install a peristaltic pump to transfer the stock solution at an appropriate continuous injection rate to achieve a 2ppm concentration of disinfectant in the water as it leaves the header tank.



i. Based on the flow rate of water into the tank prepare the appropriate daily stock solution of Virkon®S for Aquaculture

For a flow rate of lt water per minute	Daily water usage lt per day	Target concentration	Ltrs per day of stock solution required	Stock solution concentration	Kg's of Virkon®S for Aquaculture req per day
500	720,000	2ppm	144	1:100	1.44
1,000	1,440,000		288		2.88
2,000	2,880,000		576		5.76
3,000	4,320,000		864		8.64
4,000	5,760,000		1152		11.52
5,000	7,200,000		1440		14.40
7,500	10,800,000		2160		21.60
10,000	14,400,000		2880		28.80

ii. Calculating injection rate of stock solution of Virkon®S for Aquaculture

Flow rate of lt water per minute	Amount of 1% (1:100) Virkon®S for Aquaculture stock solution injected per minute - ml's	Quantity of Virkon®S required in grams
500	0.100	1
1000	0.200	2
2000	0.400	4
3000	0.600	6
4000	0.800	8
5000	1.000	10
7500	1.500	15
10000	2.000	20

Proven Efficacy Against Important Fish Pathogens

Independent laboratory testing, with a short contact time, as opposed to continuous exposure, demonstrates the efficacy of Virkon®S for Aquaculture against key salmonid pathogens. Further, this data does not necessarily represent the highest effective dilution rate for short contact time.

Infectious Organism	Fish Disease	Test Organism	Effective Dilution
Viruses			
ISA virus	Infectious Salmon Anaemia	Infectious salmon anaemia (ISA) virus	1:200
			1:100
IPN Virus	Infectious pancreatic necrosis	Infectious pancreatic necrosis birnavirus	1:100
		Infectious pancreatic necrosis birnavirus	1:500
Rhabdovirus	Infectious Hematopoietic Necrosis, Viral Haemorrhagic Septicaemia, Spring Viraemia of Carp	Snakehead rhabdovirus Strain 19	1:1000
		Snakehead rhabdovirus Ban Pako Strain	1:1000
		Spring viraemia of carp rhabdovirus	1:1000

Infectious Organism	Fish Disease	Test Organism	Effective Dilution
Bacteria			
Aeromonas hydrophila	Generally secondary invader	Aeromonas hydrophila	1:200
Aeromonas salmonicida	Salmon furunculosis, Trout ulcer disease	Aeromonas salmonicida subsp salmonicida	1:200
		Aeromonas salmonicida subsp salmonicida	1:1000
		Aeromonas salmonicida subsp salmonicida	1:200
Renibacterium salmoninarum	Bacterial Kidney Disease	Renibacterium salmoninarum	1:100
Yersinia ruckeri	Enteric Redmouth Disease (ERM)	Yersinia ruckeri	1:100
		Yersinia ruckeri stereotype 1	1:100



For full information on a complete biosecurity programme for your fish farm please consult our Aquaculture Biosecurity Programme

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