leaders in biosecurity

Aquaculture
BIOSECURITY PROGRAMME

For a safe & biosecure environment

Complete control
Broodstock / hatchery
Freshwater production
Sea water production
Processing

DuPont Animal Health Solutions
ANTEC® BIOSENTRY®

bradan LIMITED
The complete biosecurity solution

DUPONT *The miracles of science™*

Aquaculture

An introduction to fish farm biosecurity

The intensification of fish production provides an ideal environment in which disease-causing organisms can flourish and cause serious damage to productivity. Disease may come from any number of sources, for example viruses and bacteria. However it originates; it spreads through recognised vectors of infection. These include fish stocks, staff and visitors, equipment, vehicles and transportation, other aquatic life, birds and animals, the aquatic environment and even the air itself.

Medication and vaccination have traditionally played a major role in treating diseases but it is now widely accepted that they cannot, in isolation, prevent losses due to disease. Modern farming demands a holistic approach. Unless the background challenge from disease causing organisms can be controlled, and good management practices strictly followed, medication and vaccination alone are not capable of adequately protecting fish stocks. Fish must be given an environment in which the level of infection is controlled to the point where vaccination and medication can achieve beneficial effects. Biosecurity is the key to achieving this.

Biosecurity involves the exclusion of disease-causing organisms from the environment. This is particularly important in fish production. It is achieved by the use of external and internal biosecurity barriers:

- External Barriers – blocking the spread of disease onto and off of a fish farm
- Internal Barriers – blocking the spread of disease within the fish farm

The correct use and selection of disinfectants is very important and ensures that pathogen challenge is minimised, maximising the fish's natural defence against infection. This in turn will dramatically reduce incidences of disease, reducing mortality and saving you money.

There are three key factors that must be considered when selecting a disinfectant for fish farm biosecurity, these are:

- Proven Efficacy
- Environmental Impact
- Operator Safety

Proven efficacy

Not all disinfectants are effective against the wide range of viral, bacterial and fungal disease causing organisms that affect fish production. Even disinfectants with similar chemistry can have widely different spectra of activity and effective dilution rates. Selecting a disinfectant is therefore very important. Viral disease agents such as Infectious Pancreatic Necrosis Virus (IPN) and Infectious Salmon Anaemia Virus (ISA) are extremely persistent and difficult to destroy. The disinfectant must have independently proven efficacy against a wide range of aquaculture pathogens and be effective in low concentrations and at low temperatures.

Environmental impact

As well as being effective, it is important that the disinfectant causes no harm to the environment in which it is being used. Virkon® Aquatic represents a low hazard to the environment. Therefore, unlike most other disinfectants where strict discharge controls are essential, use of Virkon® Aquatic will not constrain your daily activities.

Operator safety

Given the exposure limits and dangers associated with the use of some disinfectants, particularly those based on glutaraldehyde and formaldehyde, consideration must be paid to operator safety. Virkon® Aquatic has no occupational exposure limits and at a 1% in use dilution is classified as non irritant to skin and eyes.

Virkon® Aquatic provides complete control for all aspects of fish farm biosecurity.

Application of HACCP to fish farm biosecurity

DuPont Animal Health Solutions biosecurity products and procedures have been developed to maximise the benefits achievable through good cleaning and disinfection biosecurity practices. The procedures have been developed to be consistent with HACCP principles, the seven point systematic approach to food safety adopted by livestock producers around the world.

HACCP (Hazard Analysis Critical Control Points) strategies identify the areas where pathogens may enter the system, ways to eliminate them and the methods to show that the chain of production is being continuously audited to ensure that every procedure within that chain is effective.

The principles

Principle 1 Hazard analysis

To identify hazards, both microbiological and physical, at each step in the process through to delivery.

Principle 2 Critical control points (CCPs)

At CCPs action can be taken to reduce or eliminate the hazard. For example, within the fish farm there are control points at which pathogen reduction can take place as part of a biosecurity programme.

Site security	Well boat and work boat disinfection, vehicle disinfection and footdips on piers and cages
Personnel hygiene	Dive suits and equipment, hand hygiene
Equipment disinfection	Hand nets, harvesting equipment, vaccination and weighing equipment
Surface disinfection	Tables, floors, walls
Aerial disinfection	Misting or thermal fogging within buildings to control airborne pathogens
Effluent disinfection	Blood water
Rodent control	Integrated Pest Management (IPM™) Programme
Production facilities	Broodstock, hatchery, fresh & sea water production & processing

A full list of the critical control points is described in the following pages.

Principle 3 Critical limits

Establish acceptable limits for each hazard identified. Cleaning and disinfection in accordance with DuPont Animal Health Solutions biosecurity procedures will ensure that microbiological hazards meet those limits. DuPont Animal Health Solutions technical team can advise in more detail in this important area.

Principle 4 Monitoring

Observation and measurement of cleaning and disinfecting to ensure the critical limits are met at each step.

DuPont Animal Health Solutions Dilution Testing Kits can be used to ensure products are used at the correct dilution. DuPont Animal Health Solutions Bacteriological Evaluation Kits can be used to determine effectiveness of surface disinfection.

Principle 5 Correction

Action must be taken if the critical limits are not met at each step. A review of the application procedure should be made to ensure that it is in accordance with DuPont Animal Health Solutions biosecurity guidelines.

Principle 6 Recording

A complete set of records is important for legal action and may form part of a current Quality Scheme e.g. BS EN ISO 9002. Records must be kept to show that biosecurity procedures are in place and are being implemented correctly. Records should be kept of products used, critical limits, cleaning schedules and any corrective action taken.

Principle 7 Verification

Tests and procedures to ensure that the HACCP system is working properly. The audit is often external and may include verification of dilution rates, application rates and bacteriological tests.

Key biosecurity tasks

Biosecurity plays an important part throughout every stage of the life cycle of a fish, from hatching through to processing. Thorough cleaning is an essential precursor to any effective disinfection process to maximise the benefits of Virkon® Aquatic, the complementary Biosolve® heavy duty cleaner should be used. Application rates for Biosolve® and Virkon® Aquatic as in table. The following table indicates the specific key biosecurity tasks which will have the greatest impact on controlling the spread of disease.

	Dilution rate	Application rate
Biosolve®	1:100 (1%)	500mls per square metre
Virkon® Aquatic	1:200 (0.5%)	300mls per square metre

	Key biosecurity task	Critical control point	Application	Frequency
Freshwater production Sea water production Processing	Well boats	Deck Wells Equipment Pumps	Clean thoroughly with Biosolve®, rinse with clean water then disinfect with Virkon® Aquatic	On a daily basis after use
		Protective clothing	Rinse with clean water immerse in Virkon® Aquatic for 10 mins and hang to dry	Daily or as required
		Boat hull	Disinfect routinely with Virkon® Aquatic when slipped	Refer to official guidelines
Freshwater production Sea water production	Work boats and other vessels	Decks and bilges Equipment Harvesting equipment	Clean thoroughly with Biosolve®, rinse with clean water then disinfect with Virkon® Aquatic	Daily or as required
		Protective clothing	Rinse with clean water immerse in Virkon® Aquatic for 10 mins and hang to dry	Daily or as required
		Foot dips	Fill with a freshwater solution of Virkon® Aquatic at a dilution rate of 1:100 (1%)	Replenish every 4 days or when heavily soiled
Freshwater production Sea water production	Diving teams	Diving suit Equipment Mort bags	Remove any organic debris by brushing then immerse all items in Virkon® Aquatic solution for 20 mins then rinse with clean water	On completion of operation
Sea water production Processing	Harvesting	Plant Equipment Bins and lids Stacker boxes	Clean thoroughly with Biosolve®, rinse with clean water then disinfect with Virkon® Aquatic	Daily or as required
Processing	Surfaces	Tables Floors Walls	Clean thoroughly with Biosolve®, rinse with clean water then disinfect with Virkon® Aquatic	Between production breaks
Processing	Processing equipment and utensils	Gutting machines, knives	Clean thoroughly with Biosolve®, rinse with clean water then disinfect with Virkon® Aquatic	Between production breaks or as required
Processing	Effluent	Blood water	Treat blood in holding tank with a Virkon® Aquatic 1% solution, leave for 10 minutes and then release to waste. Cover spillage with Virkon® Aquatic powder. Leave until the liquid is absorbed. Scrape powder/spillage mixture into receptacle for disposal. Rinse and disinfect the affected area with 1% Virkon® Aquatic.	As required

Broodstock/hatchery* Freshwater production Sea water production Processing

* Consult DuPont Animal Health Solutions for specialist broodstock and hatchery biosecurity programmes

Routine biosecurity tasks

The following table indicates the additional routine biosecurity tasks required for a complete biosecurity programme.

	Critical control point	Product	Dilution rate	Application rate	Frequency
DuPont vehicle disinfection programme					
Broodstock/hatchery* Freshwater production Sea water production Processing	Vehicles	Virkon® Aquatic	1:200	All vehicles entering site should pass through a wheeldip filled with solution of Virkon® Aquatic. For high risk situations please refer to DuPont's Vehicle Disinfection Programme	On arrival
DuPont hand hygiene system					
Broodstock/hatchery* Freshwater production Sea water production Processing	Footdips	Virkon® Aquatic	1:100	Place footdips at all entrances, piers and cages. Fill with a freshwater solution of Virkon® Aquatic at a dilution rate of 1:100 (1%)	On passing through area
Broodstock/hatchery* Freshwater production Sea water production Processing	Skin hygiene	Hand sanitizer	–	Hands should be washed and sanitised between areas using the DuPont Hand Hygiene System.	On passing through area
Broodstock/hatchery* Freshwater production Sea water production Processing	Protective clothing	Virkon® Aquatic	1:200	Rinse with clean water immerse in Virkon® Aquatic for 10 mins and hang to dry	After each period of use
Equipment					
Broodstock/hatchery* Freshwater production Sea water production	Transport tanks & equipment	Virkon® Aquatic	1:200	Visibly clean	After each period of use
Broodstock/hatchery* Freshwater production	Carry bins, hand nets, weighing equipment	Virkon® Aquatic	1:200	Visibly clean	After each period of use
Freshwater production	Dip nets & tank brushes	Virkon® Aquatic	1:200	Immersion	After daily use
Freshwater production	Vaccination equipment stage 1	Cleaning - Biosolve® Disinfection - Virkon® Aquatic	1:100 1:200	Clean with Biosolve® solution then disinfect thoroughly with Virkon® Aquatic solution	Between year classes and farm sites
Freshwater production	Vaccination equipment stage 2	Virkon®Aquatic	1:50	Flush with Virkon® Aquatic solution leave for 5 mins then thoroughly rinse with clean water	Between tanks and farm use
Broodstock/hatchery* Freshwater production Sea water production	Grading equipment	Cleaning - Biosolve® Disinfection - Virkon® Aquatic	1:200 1:200	Clean with Biosolve® solution then disinfect thoroughly with Virkon® Aquatic solution	Daily after use
Broodstock/hatchery* Freshwater production Sea water production Processing	Tanks	Cleaning - Biosolve® Disinfection - Virkon® Aquatic	1:200 1:200	Clean with Biosolve® solution then disinfect thoroughly with Virkon® Aquatic solution	When empty
Waste disposals					
Broodstock/hatchery* Freshwater production Sea water production Processing	Waste disposal area including skips and bins	Cleaning - Biosolve® Disinfection - Virkon® Aquatic	1:200	Rinse with clean water immerse in Virkon® Aquatic for 10 mins and hang to dry	Daily
Biosecurity barriers					
Broodstock/hatchery* Freshwater production Sea water production Processing	Path and roadway	Virkon® Aquatic	1:200	Brush or rake then disinfect with Virkon® Aquatic solution	Weekly basis

Broodstock/hatchery* | Freshwater production | Sea water production | Processing

* Consult DuPont Animal Health Solutions for specialist broodstock and hatchery biosecurity programmes

Virkon® Aquatic efficacy against specific fish pathogens

Virkon® Aquatic has been tested against a wide range of viruses and bacteria. The following table summarises the data for pathogens of particular importance to the aquaculture industry. A complete list of efficacy data may be found on our website www.ahs.dupont.com. Full copies of the independent test reports may be downloaded from this website or supplied on request from DuPont Animal Health Solutions. Please quote the test report number(s) of interest to you.

Infectious organism	Fish disease	Test organism	Effective dilution	Independent test institution	Test method and temperature
Virus					
ISA virus	Infectious salmon anaemia	Infectious salmon anaemia (ISA) virus	1:200	Atlantic Veterinary College, University of PEI, Canada	20°C and 10 minute contact time
			1:100	Molecular Biology Group, Canada	15°C with blood / mucus challenge
IPN virus	Infectious pancreatic necrosis	Infectious pancreatic necrosis birnavirus	1:100	National Veterinary Institute, Norway	4°C with 1% bovine albumin organic challenge and 10 minutes contact time
		Infectious pancreatic necrosis birnavirus	1:500	National Veterinary Institute, Norway	4°C with no organic challenge and 1 minute contact time
Rhabdovirus	Infectious Hematopoietic Necrosis,	Snakehead rhabdovirus Strain 19	1:1000	Institute of Aquaculture, University of Stirling, Scotland	20°C in cell culture fluid and 15 minute contact time
	Viral Haemorrhagic Septicaemia,	Snakehead rhabdovirus Ban Pako strain	1:1000	Institute of Aquaculture, University of Stirling, Scotland	20°C in cell culture fluid and 15 minute contact time
	Spring Viraemia of Carp	Spring viraemia of carp rhabdovirus	1:1000	Aquaculture/Fisheries Centre, University of Arkansas at Pine Bluff	UK DEFRA method - 4°C, 1% calf serum and 30 minutes contact time
Bacteria					
Aeromonas hydrophila	Generally secondary invader	Aeromonas hydrophila	1:200	National Veterinary Institute, Finland	Modified Kelsey- Sykes
Aeromonas salmonicida	Salmon furunculosis, Trout ulcer disease	Aeromonas salmonicida subsp salmonicida	1:200	National Veterinary Institute, Norway	Modified EN1276 (test temperature 4°C against an organic challenge of 1% bovine albumin and 1% yeast)
		Aeromonas salmonicida subsp salmonicida	1:1000	The Veterinary Institute, Division of Fish, Sweden	EN1656
		Aeromonas salmonicida subsp salmonicida	1:200	National Veterinary Institute, Finland	Modified Kelsey-Sykes
		Aeromonas salmonicida subsp achromogenes	1:200	National Veterinary Institute, Finland	Modified Kelsey- Sykes
Pseudomonas aeruginosa		Pseudomonas aeruginosa ATCC15442	1:100	USA	AOAC protocol+F404
		Pseudomonas aeruginosa NCIMB 10421	1:100	USA	AOAC DIS/TSS-1
Pseudomonas anguilliseptica		Pseudomonas anguilliseptica	1:100	The Veterinary Institute, Division of Fish, Sweden	EN1656
Renibacterium salmoninarum	Bacterial Kidney Disease	Renibacterium salmoninarum	1:100	The Veterinary Institute, Division of Fish, Sweden	EN1656
Vibrio anguillarum	Vibriosis	Vibrio anguillarum serotype 1	1:100	The Veterinary Institute, Division of Fish, Sweden	EN1656
Yersinia ruckeri	Enteric Redmouth Disease (ERM)	Yersinia ruckeri	1:100	National Veterinary Institute, Norway	Modified EN1276 (test temperature 4°C against an organic challenge of 1% bovine albumin and 1% yeast)
		Yersinia ruckeri serotype 1	1:100	The Veterinary Institute, Division of Fish, Sweden	EN1656

Virkon® Aquatic efficacy against specific food poisoning pathogens

Virkon® Aquatic has been proven to be highly effective against the significant human food pathogens listed below and is "non-tainting" according to independent evaluation by CCFRA. It can be used as a fogging agent for additional protection against Listeria and other food safety pathogens in processing rooms, chill rooms and ancillary areas.

Infectious organism	Effective dilution	Independent test institution	Comments
E.coli 0157 Enterococcus hirae Listeria monocytogenes Ps. aeruginosa Staphylococcus aureus Salmonella typhimurium Yersinia enterocolitica	1:100	Campden and Chorleywood Food Research Association, UK	EN1276-food area use method at 10°C

Products & dilution rates

Cleaners

Biosolve®
General Multipurpose Heavy-Duty Alkaline Cleaner

• Excellent cleaning properties • Can be used as a foam or spray • May be used through pressure washers and spraying equipment • Non staining • Non tainting • Biodegradable

Task	Dilution Rate	Application Rate
Pre-cleaning surfaces and equipment	Depending on degree of soiling prepare with 1:200 (0.5%) or 1:100 (1%) solution	500mls per square metre Leave for 15 – 20 minutes Rinse off with clean water

Disinfectants

Virkon® Aquatic

• Fast acting • Independently proven broad spectrum efficacy against viruses, bacteria, fungi and moulds • Non tainting • Exceptional safety profile

Virkon® Aquatic is a proven veterinary disinfectant with a broad spectrum of activity against a wide range of fish disease causing organisms.

Task	Dilution Rate	Application Rate
Disinfection for pre-cleaned surfaces and equipment	1:100 (1%)	300mls per square metre
Footdips	1:100 (1%)	Fill with a freshwater solution of Virkon® Aquatic Replenish every 4 days or when heavily soiled
Vehicle disinfection	Please refer to DuPont's Vehicle Disinfection Programme	
Aerial misting	1:100 (1%)	10mls per cubic metre
Thermal fogging	1:25 (4%)	10mls per cubic metre

For additional tasks please refer to the enclosed programme

Specialised products

Hand hygiene system

• Disinfects hands effectively • Kills germs • User friendly • Economical in use

DuPont Antibacterial Hand Soap's broad spectrum of activity kills over 95% of germs. DuPont Instant Hand Sanitizer with no need for washing water kills 99.9% of germs.

Tomcat®2 rodenticides

• Kills rats and mice resistant to some other anticoagulants • Highly palatable • For all weather conditions – inside and outdoors • Choice of TOMCAT®2 BLOX™, PELLETS and PLACE PACS

Rats and mice are responsible for the spread of many diseases. Ensure a suitable control programme is put into place using proven rodenticide such as TOMCAT®2 (UK, N. Ireland and South Africa customers only).

Dilution test kits

Dilution Testing Kits are designed to help save money and avoid wasting valuable sanitizers and disinfectants, ensuring that they are applied at the correct strength during cleansing and disinfection procedures.

The Dilution Testing Strip is easy to use. Simply dip the strip into the solution for 1-2 seconds, remove and gently allow excess solution to run off. Read the result, ideally within 10 seconds, by comparing to the colour chart on the bottle. Full colour formation takes a couple of seconds after removing the strip from the solution.

Biosecurity Accreditation System

A support and training package to ensure you operate with the highest standards of biosecurity including:

- Customised HACCP compliant biosecurity programme calculating product usage requirements to eliminate waste.
- Dilution testing kits to ensure DuPont disinfectants and sanitizers are used at the correct dilutions to kill pathogens.
- Written records demonstrating that the HACCP system is being continuously and consistently monitored.

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