A Broad-Spectrum Disinfectant for Fish Processing

1. What is Dutrion®?

Dutrion® is a tablet or two-component powder kit that creates a chlorine dioxide (CLO2) concentrate when mixed in ordinary tap water. Dutrion® is a convenient, economical and safe method to produce CLO2 in solution without generating by-products such as chlorite, chlorate, chloride or free chlorine. Dutrion® is non-explosive and has almost no decay during first 60 days. The shelf life in powder form is 2-5 years, depending on storage conditions. Like ozone, CLO2 is soluble as a true gas. Because it is a true gas in solution it is easily diluted into target water as a biocide. CLO2 can penetrate bacterial slime layers (biofilm) and destroy pathogens. Dutrion® does not form toxic and carcinogenic chlorination by-products. Nor does it produce a build-up of toxic organic or inorganic by-products, such as bromates, THM's, HAA's and MX. This makes CLO2 one of the most eco-friendly biocide available.

Dutrion® is used in drinking water treatment, water purification, food and beverage industries, hospitals, hotels, horticulture, aquaculture, agriculture, livestock, poultry, crop irrigation and many other applications.

2. Application Areas

Aquaculture Industry:

Live Fish Transport

- Transport Water
- Disease treatment during holding

Aquaculture

- Disease prevention treatment
- Fish larval rearing
- Prawn larval rearing
- Spraying in feeds
- Treatment of diseases

Fish Industry:

- Fishing boats
- Wholesale/Retail
- Dipping de-scaled and gutted fish
- Spray/Dipping for fish and prawns
- In sorting/grading water for prawns
- Ice manufacture
- Disinfection of display cabinets

While great care and attention is taken to minimize the risk of infection from processing staff and other food handlers, relatively ineffectual biocides and disinfectants are used to treat process water and equipment.

Beware, that even a single contaminated batch of food, or one poor or erratic output can destroy a food company's reputation and business.

Water is the single largest raw material used in processing systems. The quality of the process water is of great importance to prevent the contamination of food products. The use of contaminated water in food processing plants can spread infection across the entire distribution system and contaminate entire batches of produce.

Water, whether obtained from a municipal source or any other source, will always carry bacteria. Many are harmless but others may include fecal coliforms, E. Coli, salmonella, legionella, lysteria, and deadly fish viruses. Also the fish industry has the potential for generating large quantities of solid wastes and contaminated effluent/ wastewater.

Manufacturers offer a large number of disinfectants, each claims to be the best on the market. Commonly available disinfectants contain chemicals of the following groups:

- Chlorine and chlorine-releasing compounds.
- Quarternary ammonium compounds.
- Amphoteric (ampholytic) compounds.
- Phenolic compounds.
- Peracetic acid

The disadvantage**s** of the above chemicals are many. Their disinfectant properties are limited by many factors, as listed below:

- The concentration of available chlorine needs to be as high as 100 to 200 mg/liter.
- Peracetic acid and Quats are only effective in high doses.
- Peracetic acid produces acetic acid, which is an excellent nourishment for micro organisms. Thus, bacteria grow/enlarge more efficiently after using peracetic acid.
- To reduce breakdown during storage, a hypochlorite solution should be maintained at pH 9 to pH 11 i.e. has pH limitations.
- Disinfection capabilities are diminished in the presence of fats, oils, proteins, body fluids etc.
- Conventional disinfectants are non-effective against wide range of bacteria, spores, fungi and viruses.
- Hypochlorite is more efficient if the concentration and temperature are raised and/or the pH is lowered.
- Conventional disinfectants are both temperature and contact time dependent. Long exposure time is required.
- Conventional chemicals are corrosive and stain common metals.
- Organic material consumes chlorine and reduces it's disinfection capacity.
- Conventional disinfectants develop toxic gases and irritate the eyes, mucous tissues and skin of personnel.

Chorine is often used as a treatment for wash water, although there are frequent problems with taste tainting and unpleasant working environments at high levels**.**

Dutrion®, a very powerful biocide with multiple **advantages** over other products commonly used in the industry. Dutrion® is pure CLO2 that kills bacteria and viruses in water streams. Dutrion® can be used at low levels for the transportation of eggs to the hatchery. Dutrion® can be used as a short-term bath at the first sign of bacterial or fungal infection, in order to reduce the risk of opportunistic infection. Dutrion® can be used for the short term transport of alevins, fry or smolts where stocking densities are high. For instance the movement of fry from the hatchery to nursery ponds or growing cages. It is important to use a biocide in these areas, as there is a high risk of infection caused by surface to surface contact and de-scaling.

Dutrion® can be added to water/ice that is used in processing any fish. The ice used for packing fish should be manufactured with CLO2. The slow release of CLO2 onto the surface of fish as the ice melts helps to prevent spoilage and odors during transport. It maintains the microbial quality of water even in the presence of high organic loading, thereby impacting upon quality maintenance and substantial improvement of the shelf life of products.

CLO2 is effective in treating wastewater discharges and removing odor problems associated with fish processing plants. CLO2 is proven against botulism organisms and other food contaminants such as salmonella, staphylococcus, streptococcus etc. Even the most resistant strains of fungi are completely destroyed in 60 seconds. Tricophyton mentagrophytes are killed in 5 minutes. The most difficult organisms of all (spore formers) are destroyed in 5 minutes. This is many times faster than most chemicals; yet Dutrion® is safe and requires no restrictions on use in direct contact with food.

3. Germicidal Spectrum

Bacteria	
Pseudomonas Aeroginosa	Campylobacter Jejuni
Pseudomona Specie	Flavobacterium Species
Enterobarcer Cloaceae	Yersinia Enterolitica
Enterobarcter Hafnia	Clostridium Sporogenus
Proteus Vulgaris	Clostridium Dificile
Klebsiella Pneumoniae	Clostridium Perfingens
Salmonella Typhi	Fusobacterium Nucleatum
Salmonella Enteritidis	Bacilus Subtilis
Salmonella Gallinarum	Bacilus Circulans
Salmonella Typhimorium	Bacilus Megatarium
Salmonella Choleraesuis	Bacilus Cereus
Salmonella Typhosa	Bifedibacter Liberium
Corynebacterium Nucleatum	Staphylococcus Aureus
Sarcinae Lutae	Staphylococcus epidermia
Streptococcus Pyrogenes	Streptococcus Faecalis
Strep 1, 2, 3.	Mycobacteroi Bovis
Mycobacterium Smegmatis	Mycobacterium kansaaii

Fungi	
Candida Albicans	Trichophyton Rubrum
Scopulariosis Species	Aspergillus Niger
Trichophyton Mentagrophytes	Aspergillus Flavus
Mucor Species	Fusarium Specie
Saahromyces Cerevisiae	Fonsecaea Pedrosoi

Virus	
Herpes Virus I	Poliovirus
Herpes Virus II	Encephalomyocerditis (EMS)
Adenovirus Echovirus	Vaccina Virus
Coxsakievirus	Vesicular Stomatitis Virus (VSV)
Influenza	Para Influenza
Feline Parvovirus	Bluetongue Virus
Mouse Flu	Mouse Hepatitis Virus (MHV)
Minute Virus of Mice (MVM)	Mouse Encephalomyelitis Virus
New Castle Disease Virus	Mouse Polio Virus (MEV)
Iridovirus	Pertiviries – Togaviridae

Others	
Vidrio Cholerae	Culex Quinquifasiatus
Mycoplasm	

4. Cost Comparison

An absolute comparison per volume against other disinfectants does not provide the real cost comparison with Dutrion®. Other cost factors include:

- The elimination of expensive Chlorine Reactors, plus the costs of ownership, including maintenance, certification & re-certification.
- Security measures & risk and liability insurance policy.
- Training, certification and re-certification of qualified personnel.
- Environmental, explosion, health & safety factors.
- Hazardous materials transportation and storage costs.
- Corrosion to water systems, equipment, pumps, filters.
- Use of additional chemicals e.g. pH level stabilizers.
- The penalties of NOT delivering the required biocidal results.
- No adverse environmental or ecological effects.
- Precise dosage management.
- No investment required in infrastructure or equipment.

Powerful Water Treatment

Dutrion® in Shrimp Culture

Dutrion® is an economical chlorine dioxide solution, free of any contaminations. Dissolving the components “A” and “B” or just one Dutrion Tablet in ordinary water creates a 0.2% concentrate in liquid form. This concentrate is dosed into the target water to act as a powerful disinfectant. Dutrion® is in use in many countries as a broad-spectrum, safe, highly effective disinfectant.

Dutrion® eliminates the disadvantages in performance of gaseous ClO2, which is extremely active and is prone to the danger of spontaneous explosion on contact with air. Dutrion® not only retains the advantages of gaseous ClO2 but provides additional advantages. These include high capacity of oxidation, no degradation, no harmful disinfection by-products, no residue and no corrosion. The product has a long shelf life in powder/tablet form and up to 60 days in ready-to-use liquid concentrate form, depending upon storage conditions. Since 1993, when shrimp eruptive epidemics affected all seaside breeding ponds across Southeast Asia, shrimp culture has suffered gross economic loss. Research conducted worldwide concluded that conditional diseases, such as viral and bacterial diseases, mainly induced the epidemic. Deterioration and pollution of the ecological environment of aquaria are the main causes of shrimp diseases.

Dutrion® has broad-spectrum capacity to kill microbes such as bacterium, sporangium, fungus, viruses and epiphytes. It has no side effect to superior species. Microbes will never become resistant to Dutrion® as the product penetrates the cell wall and destroys the interior DNA. As a strong oxidative agent, Dutrion® will decompose almost all reductive materials in water. This includes residual feed and excrement, resulting in an improved environment in breeding aquaria and ponds. Dutrion also enhances the concentration of dissolved oxygen. The net effect is to prevent the break out and promulgation of epidemics in fish and shellfish farming.

Many studies have demonstrated the high efficiency of Dutrion® in killing microbes and viruses.

Dutrion® can be applied to Pond water via a solution dispensed from a boat, oxygenating fountain or foam raft.

For disinfection of a feeding pond, after removal of dirty mud at the bottom of the pond and before the pond has been re-filled, simply spray concentrated Dutrion® onto the pond bottom and walls for complete disinfection.

The disinfection of feeding water is required during fish breeding and growth. Residual feed and aquatic excrement contaminates the water and the water body significantly deteriorates, leading to the rapid propagation of pathogenic microbes, causing disease and high mortality in fish and shellfish stocks.

Dutrion® decomposes polypeptides and breaks the bond in microbial proteins, RNA and DNA to kill all microbes. The product also reacts with amines and sulfides in breeding water, air and on the surface of fish and shrimp and any materials so as to eliminate odor and to provide clean water and air.

To use Dutrion®, first determine the amount of the water in a pond. Dose Dutrion® into the water at a rate of 0.05~0.1 mg/L in a breeding pond with a **water depth of 1 meter**. The dosage should be adjusted according to the quality of the water. Efficiency is enhanced if 20kg/Mu of calx were additionally dosed into the pond the next day.

For disinfection and sterilization of pregnant shrimp during the half month period before a pregnant shrimp lays eggs, dose 0.1~0.2 mg/L of Dutrion® into the pond per 3~7days, until the eggs are laid. This disinfection improves the health of pregnant shrimp and of the offspring.

For disinfection of the environment in a hatching room mist 1.6 liter to 2.4 liter of Dutrion® per 100 m3 of space in the laying room to decontaminate the room.

Disease prevention at all stages during the growth of shrimp

Dutrion® may be applied at 4 stages, starting from fertilized eggs to the breeding stage, as follows:

- At the 1st fertilized egg stage apply Dutrion® to the water body at a dosage rate of 0.02 mg/L.
- At the 2nd stage apply Dutrion® into breeding water at a dosage rate of 0.02~0.05 mg/L
- At the 3rd stage maintain the water body with a dosage of 0.05~0.1 mg/L.
- At the 4th stage continuously dose at a rate of 0.05~0.15 mg/L .

To eliminate shrimp's virus and bacterial diseases dose daily with 0.15~15 mg/L into breeding water with a depth of 1m. Repeat for 3 to 5 days. This process will prevent viral and bacterial diseases and demonstrate high efficiency in defending against epiphyte diseases.

Disinfection of facilities in shrimp culture, equipment, tools, utensils and everything that comes into contact with shrimp/breeding water should be dipped or sprayed with concentrated Dutrion® so as to prevent infection, disease propagation and reoccurrence.

The chlorine dioxide process is "extraordinarily" better than other chemical methods of eliminating pathogens on produce

Chlorine Dioxide