

The use of compounds sold as disinfectants in aquaculture is wide spread. In fact in most fish and shrimp hatcheries, fish and shrimp farms (ponds, cages, raceways, etc.) compounds are used routinely for the purpose of killing bacteria, viruses and other pests that might impact productivity. Depending upon what country that they are being used in regulations that govern their legal use can range from being quite simple to onerously complex. Ultimately the decision to use these compounds depends on their availability, their history of use by the staff and the perceived usefulness/effectiveness of the compounds. The user should bear in mind that some of these compounds may be hazardous to the health of the employees, to the animals that they are being used on and to the environment. Their use may not constitute responsible aquaculture practices.

Disinfectants have a dictionary definition, which is likely the definition that we all are familiar with. The American Heritage Dictionary defines a disinfectant as “An agent, such as heat, radiation, or a chemical, that destroys, neutralizes, or inhibits the growth of disease-carrying microorganisms”. This is the definition that we normally think of and encompasses a wide range of chemical and other agents, some of which are listed in Table 1.

From a US regulatory standpoint, disinfectants are a category of antimicrobial pesticides. The sale of these products is regulated in the US by the Environmental Protection Agency (EPA). The types of disinfectants that would be used in aquaculture are considered non-public health products and are used to control the growth of algae, odor-causing bacteria, bacteria which cause spoilage, deterioration or fouling of materials and microorganisms infectious only to animals. They are licensed to be used on hard inanimate surfaces and objects to destroy or irreversibly inactivate infectious fungi and bacteria but not necessarily their spores. If compounds are used on living animals they are considered to be drugs and are regulated by the FDA. This means that if a compound is used specifically for the purpose of treating or preventing a disease in an animal it is a drug.

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Adding a disinfectant to the water when animals are present to kill a pathogen would fall into this category. This use falls outside of the scope of this article and will be addressed in a subsequent article.

Table 1. Some commonly used classes of disinfectants used in aquaculture*

Compound	Description	Comment
UV Disinfection	Uses lamps generating UV light to kill bacteria, viruses, etc.	Widely used in hatcheries and in RAS. Effectiveness is variable.
Ozone	O ₃ ; toxic derivative of oxygen	Widely used as well. Can form toxic residues and can be very toxic to larval animals.
Quaternary ammonium compounds	Broad spectrum chemical compounds known as "Quats"	Widely used on farms in SE Asia in the water. Used to kill bacteria and viruses.
Iodophors	Iodine based compounds; complexed with PVP.	Egg disinfectant, foot bath and hand sanitizers. Corrosive.
Chlorinated Compounds	Contain Chlorine as the active ingredient	Foot bath, water sterilization, most very toxic to fish and shrimp. Can be hazardous for workers as well.
Copper Compounds	Copper as an elemental or in a chelated form	Algaecides, although used as molluscides. Can be toxic.
Calcium Hydroxide, Calcium Oxides	Lime, burnt lime, etc.	Algaecides, used to kill bacteria and viruses in the water as well. Caustic and potentially hazardous.
Peroxides	Use killing action of oxygen	Algaecides, used to kill bacteria and viruses in the water as well. Caustic and potentially

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		hazardous.
Pesticides	Variety of different modes of action.	Used to kill viral vectors. At least one is routinely used in shrimp hatcheries as a fungicide.
Aldehydes	Highly reactive chemical groups against proteins	Used to kill parasites and protozoa. Broad spectrum activity. Potentially hazardous to workers.
Dyes	Variety of modes of action	Used to kill fungi and other organisms. Some are banned for use in aquaculture.

This list is for illustration purposes only. It is not intended to be all inclusive nor is it an endorsement of the use of these compounds. The definition and scope of use in this table conforms to the dictionary definition, not the regulatory definition in the US.

In the US, although many different compounds are in use, the claims on the label determine what uses that a product can be marketed for. While using the product for other applications may or may not be biologically problematic it is potentially risky and may be illegal. The Federal Joint Subcommittee on Aquaculture Working Group on Quality Assurance in Aquaculture Production has published a “Guide to Drug, Vaccine, and Pesticide Use in Aquaculture” that can be consulted to get a better idea of what is available for legal use in the USA. Rather than list the compounds that are approved, the reader is referred to the following URL (<http://aquanic.org/jsa/>). At this time the US does not regulate what compounds are used outside of the US for products that are consumed in the US and this is not likely to occur in the near future. However, residues are a potential issue and it is possible that eventually residues will be found in imports and this will spur regulatory action to limit the use of specific compounds. It should be kept in mind that many of the compounds that are widely used globally have never been adequately tested for residues and no tolerances have been established.

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The subject of disinfectants is a complex issue. Even in those cases where the use is without known harm or risk, the user should understand that if the possibility exists for residues in the final consumed product, that their use would be considered potentially irresponsible and while it may escape regulatory action could result in harm to end users, the crop itself and ultimately in some very serious and economically damaging restrictions. They should be used responsibly and with an understanding of how they act and what they are effective against.

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