

Antiseptics and Disinfectants

Disinfection

- **Disinfection**-Destruction or inhibition of growth of all pathogenic organisms (bacteria, viruses, fungi) on non living surfaces.
- **Disinfectant**-Chemical agent used for disinfection is called disinfectant.

Antiseptics

These are chemical substances which inhibit the growth or kill microorganisms on living surfaces such as skin and mucous membrane.

Properties of good antiseptic and disinfectant

1. Bactericidal or fungicidal, or anti-pathogen
2. Non staining & good odour
3. Active against all pathogens
4. Active in presence of pus, blood & exudates
5. Rapid acting
6. Non irritating to tissues / non corrosive
7. Non absorbable
8. Non sensitizing

Distinction between disinfectant and antiseptic

Disinfectant

- reserved for inert materials (premise, rearing equipment),
- Very high concentrations of active ingredient(s)

Antiseptic

- reserved for an external administration on animals,
- High concentrations of active ingredient(s)

But, certain products are used both as an antiseptic and as a disinfectant.

Types of Disinfectants used in Aquaculture

1.Lime

- Liming is considered an integral part of pond management.

- Role of lime:

- a) ↓ soil acidity,
- b) ↑ total alkalinity,
- c) ↓ BOD,
- d) neutralizing sulfides and acids,
- e) precipitating suspended organic material,
- f) improving nitrification



CaCO₃

- There are several types of lime that are used in grow-out ponds - most common is Agricultural lime (CaCO₃).
- To disinfect, 100-300 kg/ha is applied in fish ponds during the culture period.

2. Formalin

- Formalin kills microorganisms by condensing with amino acids to form azomethines.
- It is active against a wide range of organisms, including fungi, bacteria and ectoparasites.
- Formalin has been approved by most of countries including US FDA for use in treatment of food fish.
- The recommended dosage rates are 150 ppm for a 1 h bath and 25 ppm for long-term treatment.
- Formalin is also applied directly in ponds at rates varying from 10-25 ppm, especially during protozoan outbreaks.
- However, formalin also causes oxygen depletion and this excess can be deleterious in the long run.



3. Potassium permanganate (KMnO₄)

- KMnO₄ , is a oxidizing agent that will react with any organic matter in a pond including algae, bacteria, fish, and organic bottom sediments.
- It has been used in fish ponds to treat common fish pathogens such as **gill parasites** and **external bacterial** and **fungus infections**.
- Contrary to some reports, KMnO₄ does not add significant amounts of oxygen to water and actually **decrease dissolved oxygen** concentrations by killing algae that produce much of the oxygen in ponds.
- Common treatment rates are **2 ppm** or 1 mg/L for an indefinite pond application or 10 mg/L for a 10-minute tank treatment.



4. Sodium chloride (NaCl)

- Used as a 3% solution for 10-30 minutes as a parasiticide.
- Used as a 0.5-1% solution for an indefinite period as an osmoregulatory aid for the relief of stress and prevention of shock.



NaCl)

5. Benzaklonium Chloride (BKC)

- BKC is a cationic compound that, like formalin, is toxic to a wide range of bacteria, fungi, and viruses.
- Unlike formalin, it is non-irritating to tissue and has a rapid onset of action.
- Suggested dosages are 1-1.25 ppm.



BKC

6. Acriflavine (3,6-Diamino-10-methylacridinium chloride mixt)

- Following are some aquarium diseases

successfully treated by acriflavine:



- *Oodinium pilularis*: a protozoan parasite that causes an infection called **Velvet Disease**
- *Flavobacterium columnare*: a bacteria that causes an infection known as **Columnaris or Cottonmouth**
- Fin Rot: several species of bacteria causing fins and tails to become ragged and frayed.
- Egg Fungus: a mild disinfectant for fish eggs.
- *Saprolegnia* spp.: a fungal infection of freshwater fish.
- Dose @ 0.02 mg/liter for three days and repeated if required. Disadvantage of acriflavine, insoluble in salt water and phytotoxic.

7. Malachite Green

- Malachite green has been extensively used in controlling infections due to bacteria, fungi, protozoans and monogenetic trematodes on eggs, fry and adult fish.
- In recent years, however, there have been strong moves against malachite green application, especially with respect to its use in food fish.
- This is because the chemical has a moiety that is known to be carcinogenic.

Dose@1-2 ppm



Malachite green



8. Hypochlorite

- Both sodium and calcium hypochlorite have a long tradition of use in the aquaculture industry.
- They are particularly effective in acidic conditions. For example, the bactericidal effect of hypochlorite is 10 times greater at pH 6 than at pH 9.
- At pH 7.0, @ 0.1-0.25 ppm hypochlorite solution will kill most organisms within 15 to 20 sec.



9. Zeolite

- Zeolite (silicon, aluminum and oxygen) is often used by fish and shrimp farmers to improve pond bottom condition.
- This is related to its capacity to absorb ammonia and metabolites from water.
- However, the efficacy of zeolite in this respect diminishes with increasing hardness.
- Recommended doses for Pond preparation: @ 50 kg/ha; during culture: @ 10-20 kg/ha



Zeolite

Copper Sulphate

- Copper sulphate is a broad-based disinfecting agent used in fish/shrimp farms.
- It is effective against a wide range of organisms including blue-green algae, bacteria, fungi, protozoans, digeneans, leeches and monogeneans.
- Copper sulphate is used at a rate of 0.5 ppm in freshwater ponds.



Mechanism action of disinfectant

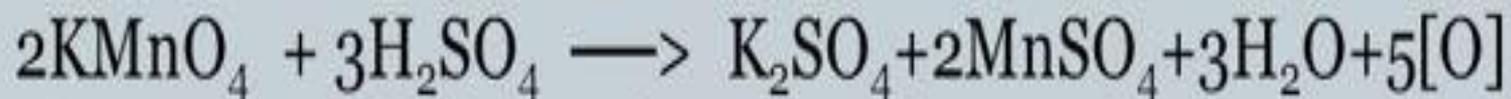
Formalin

Formaldehyde solution (Formalin)

- Has antimicrobial (vegetative forms and spores) and deodorizing effects.
- MECHANISM OF ACTION: dehydration of microbial cells protoplasm proteins causing its destruction.
- Is used as a disinfectant and deodorant, skin treatment with sweating (0.5-1%), disinfection tools (0.5%). For the preservation of anatomical objects.

KMnO₄

- Acid solutions of potassium permanganate reduces the permanganate ion ($\text{MnO}_4^- / \text{Mn}^{+7}$) to the manganous ion with the evolution of oxygen.



- Neutral or alkaline solution produces a brown precipitate of manganese dioxide (MnO_2).



- The antibacterial action is dependant upon its oxidation of protein or other bioorganic substances. The oxygen released is the effective agent.

Sodium Hypochlorite

- **Mechanism of Action**

- reactive chlorine in aqueous solution exists in two forms- hypochlorite (OCl^-) and hypochlorous acid (HOCl).
- State of available chlorine depends on pH of solution, i.e. above pH of 7.6, it is mainly hypochlorite form and below this pH, it is hypochlorous acid.
- Presence of 5 percent of free chlorine in sodium hypochlorite is responsible for breakdown of proteins into amino groups
- The pH of commonly used sodium hypochlorite is 12, at which the OCl^- form exists. Hypochlorite dissolves necrotic tissue because of its high alkaline nature (pH 12)