

Chemotherapy

Brief history, Definition, Antimicrobial agents (AMAs)

A short history of chemotherapy

- German scientist Paul Ehrlich is considered the father of chemotherapy for his work in the field of immunology and chemotherapy.
- But chemotherapy treatment for cancer really has its roots in the Second World War when it was discovered that U.S. naval personnel who had been exposed to mustard gas displayed changes in their bone marrow cells.
- In subsequent research, a compound called nitrogen mustard was found to work against lymphoma.
- This was the beginning of work on agents that killed rapidly growing cancer cells.

- Not long after, a Boston researcher showed that a compound related to folic acid produced remissions in children with leukemia.
- That compound — aminopterin — was the predecessor of methotrexate, a cancer treatment drug that is still used commonly today.
- Researchers have since discovered numerous drugs that block different functions related to cell growth and replication.
- A major advance was the discovery that cancer drugs were significantly more effective when used in combinations.
- By the late 1960s, combinational chemotherapy was successful in curing a significant portion of lymphoma.
- In recent years, treatments have become more targeted to be more effective and produce fewer side-effects, and work is continuing. As well, drugs to reduce and control side-effects have advanced significantly over the years.

- **Chemotherapy definition:** The treatment of disease by the use of chemical substances, especially the treatment of cancer by cytotoxic and other drugs.
- **Antimicrobial agent (AMA):** any agent that destroys or inhibits the growth of microorganisms.
- A chemical drugs used to treat a microbial infection, which is a general term referring to
 - Antibiotics
 - Antifungals
 - Antiprotozoal or Antiparasites
 - Antivirals
- Any of a large variety of chemical compounds and physical agents that are used to destroy microorganisms or to prevent their development is simply terms as Chemotherapy.

First antimicrobial agents (AMA) used in aquaculture

- The discovery and development of antimicrobial agents to treat systemic bacterial infections is one of the most fascinating stories in the history of microbiology, since early workers examined the property of azo dyes for possible antimicrobial action.
- Chemical modification of a synthesized compound called prontosil led directly to another series of compounds, the sulphonamides, which were soon recognized as having early potential for treating furunculosis in trout.
- Penicillin was the first natural antibacterial agent that was clinically successful in the medical field.
- Although Fleming observed the inhibition of *Staphylococcus aureus* on an agar plate by a contaminating *Penicillium* it was some years later when other workers purified enough penicillin for clinical trials. Since this early work in the 1940's, there have been many reported studies on chemotherapeutic agents, with the result that there are now antibiotics available for virtually all bacterial infections.

Therapy

- **Therapy Definition:** Therapy is a administration of a drugs or chemical compounds in water or through feed or via any other means, after a disease is diagnosed.
- **Causes of disease:**
- There are three major causes of fish diseases:
 - Presence of environmental pathogens.
 - Low resistance of the fish stock .
 - Unsatisfactory water environment .

Treatment Process

- Four things should be understood before resorting to treatment :-
 1. Know the water
 2. Know the fish
 3. Know the chemical
 4. Know the disease
- Treatment should be considered on a population basis.

Routes of Drug Administration

- Water
 - Oral
 - Injection
-
- Do not feed the fish 24 hour prior to treatment.
 - Sequence of activities:
 - ✓ Pretreatment checklist.
 - ✓ Treatment checklist.
 - ✓ Posttreatment checklist.

Water borne treatments

- Addition of drugs in to water.
- Can cure ectoparasitic as well as systemic diseases.
- Dosage critical.
- Three pathways.
 - A. Gastro-intestinal pathway
 - B. Gills
 - C. Skin

- Water borne treatments – 2 types
 - A. High drug concentration- short exposure time.
 - B .Low drug concentration- long exposure time.
- Perform bioassay when drug is used for first time.
- Disposal of drugs.

Water Borne Treatments

- Most common method.
- Easy and non-stressful.
- Dosing problems.
- Unstable and formation of toxic by-products.
- Used mainly for surface dwelling pathogens.
- Can also be used for systemic diseases.
- Common method when drugs of low therapeutic value are used.

Different type of water borne treatment:

Dip treatment.

Bath treatment.

Flush treatment.

Prolonged immersion treatment.

Oral Medication

- Mix the drugs with the pelleted feeds at the required dosage.
- Used mainly for caged and pond reared fish.
- Diseased fishes are reluctant to take feed.
- Methods:-
 1. Commercial Medicated feeds.
 2. Artemia loading.

- **Advantages**

1. Minimum stress.
2. for mass treatment.
3. Good for cages and ponds.

- **Disadvantages**

1. Fishes may be reluctant to feed.
2. Poor pond conditions.
3. Development of drug resistant bacteria.

Injection

- Injecting the drug into the body of the fish.
- Highly stressful.
- Fish needs to be sedated.
- But a precise dose shall be delivered.
- Fishes must be weighed properly.
- Giving injection to very small fish is difficult.

- Types:
 - Intraperitoneal:
 - Injection should be given near the ventral midline.
 - Better option for small fishes.
 - Intramuscular:
 - Fish should be 13 Cm or more in length.
 - Best site is just lateral to the dorsal fin.
 - Only smaller quantities can be injected.

THERAPY

Name of disease	Causative agent	Treatment
1. Fin rot and tail rot	Pseudomonas spp, Aeromonus spp	bath treatment in 1:2000 copper sulphate for 2 minutes or swabbing of concentrated copper sulphate solution in the affected fishes.
2. Dropsy	Aeromonus hydrophila and myxozoan	Terramycin in the feed (80ppm)

THERAPY

Name of disease	Causative agent	Treatment
3. Eye disease	Staphylococcus aureus	Chloromycetin bath @ 8 - 10mg/L Disinfecting the environment with Potassium permanganate at a dose of 0.1 ppm followed by liming@300 ppm check the disease.
4. Ulcer	Aeromonas sp, Pseudomonas sp	0.5 ppm solution of KMnO₄, tetracycline 75-80 mg/kg mix with feed continue 10-12 days

THERAPY

Name of disease	Causative agent	Treatment
5. EUS	<i>Aphanomyces invadans</i> (oomycete)	200 kg/hac quicklime or 0.1 ppm CIFAX
6. Ichthiriophthiriasis	Ichthiriophthiriasis mulata	2% NaCl for 7-10 day, quicklime 200 kg/ha
8. Dectylogyrosis & Gyrodectylosis	Dectylogyrosis sp, Gyrodectylosis sp	3-5% NaCl bath, effected pond treat with 25 ppm fomalin or 4 ppm KMnO4

THERAPY

Name of disease	Causative agent	Treatment
10. White gill spot disease	Mixobolus benjalensis, M. catlae	Add yeast to feed 1g/kg, 2-3% NaCl bath, reduce density
11. Argulosis	Argulus sp	5 ppm KMnO4 dip, treatment with Botux three times @ 35 ml/ha-m weekly intervals

THERAPY

Name of disease	Causative agent	Treatment
13. Branchiomyces	Branchiomyces sp	3-5% NaCl or 5 ppm KMnO ₄ bath for 5-10 min and effected pond apply quicklime 50-100 kg/ha
14. Saprolegniasis	Saprolegnia parasitica	3-5% NaCl or 5 ppm KMnO ₄ bath for 5-10 min, 1-2 ppm of malachite green bath for 1 hr. effected pond can apply 20 ppm of formaline.

References

- Edward J. Noga, 2002. Fish Diseases: Diagnosis and Treatment. Blackwell Publishing.
- Federal Joint Subcommittee on Aquaculture. 1994. Guide to drug, vaccine and pesticide use in aquaculture. Texas Agricultural Extension Service, College Station, Texas.
- Herwig, N. 1979. Handbook of drugs and chemicals used in the treatment of fish diseases. Thomas, Springfield, Illinois.
- Noga, E. J. 2000. Fish diseases: diagnosis and treatment. Iowa State University Press, Ames.
- Roberts R.J. (ed) (1989): Fish pathology. Ballière Tindall, pp. 467.
- J. Tesarčík, Z. Svobodová, 1991 . Diagnostics, prevention and therapy of fish diseases and intoxications. FAO, Manual.
- John.A.Plumb, 1999. Health Maintenance and Principal Microbial Diseases of Cultured Fishes.