Treatment with drugs and chemicals for control of fish diseases is most feasible with cultured fish; rarely can diseases be prevented or sick fish helped in the wild. Diseases of cultured fish fall into three categories: infectious, nutritional, and environmental. Infectious diseases of fish are further divided into those caused by viruses, bacteria, parasites (protozoans and worms), and fungi.

Intensively cultured fish are often under stress caused by crowding, which may produce unfavorable environmental conditions such as low oxygen, high ammonia levels. Acting together, or as pathologists say, "synergistically," these factors may give disease agents an opportunity to cause significant losses.

With few exceptions, viral diseases of fish—like viral diseases of other animals—cannot be controlled by drug treatment. Effective control against these minute disease-causing agents is best
achieved by avoiding infection. This can be done by obtaining fertilized eggs from parents free of viral disease and using a water supply known to be free of fish that harbor viruses.

Bacterial infections are seen most commonly when the fish are under stress. Many of the bacteria persist in the fish environment all the time. There are two general types of bacterial fish diseases: External infections, affecting skin, fins, and gills, and internal infections in which all the internal organs may be invaded.

**Treated As A Group**

Regardless of the type of infection, cultured fish are treated as a population. Exceptions may occur when individual fish are easy to handle or are extremely valuable—such as brood fish or ornamental fish.

External bacterial infections of fish cultured in concrete raceways or in ponds are treated with different chemicals depending on the particular bacterium causing the disease outbreak.

Chemicals may be applied as a bath treatment, exposing fish to the chemical for a prescribed period, usually an hour. When a flush treatment is called for, the chemical is flushed through the raceway or pond. Another regimen may prescribe an indefinite bath; the chemical is added and not removed. For a constant flow treatment, the chemical is added at the water inlet for an hour or more.

Commonly used chemicals for bacterial diseases include copper sulfate, potassium permanganate, and quarternary ammonium compounds such as Hyamine 3500. Treatment levels required depend on the particular bacterium causing disease. Consult texts on fish health for recommended treatment procedures.

**Medicated Feed**

Internal bacterial diseases of fish are treated by incorporating drugs into feed. Treatment must begin in the initial stages of disease when fish are still eating.

In hatcheries, drug treatments range from 3 to 10 grams of drug for each 100 pounds of fish treated. Medicated treatment lasts 10 to 14 days. Commonly used drugs include sulfamerazine and Terramycin.

For treating large numbers of fish, medicated feed is prepared by a feed manufacturer. Medicated feed for treating smaller numbers of fish (1,000 to 2,000 pounds) is...
prepared by coating feed with the appropriate drug using gelatin or oil as a binder.

Parasites, like bacteria, can be both external and internal infections in fish; external infections generally are regarded as the more important. Severe disease outbreaks in cultured fish are caused by external parasites, and significant mortality will occur if the parasite infection is not rapidly and effectively treated. Such outbreaks may be treated with 166 to 250 parts per million (ppm) formalin (formaldehyde gas dissolved in water) for 1 hour.

Internal parasite infections rarely are treated. So, as with viral diseases, avoidance is the only effective means of control. Some large internal parasitic infections, such as tapeworms, can be effectively treated by incorporating tin oxide in the diet.

Fungus infections occur most often in developing eggs, and as a secondary infection in fish weakened by other diseases. However, they can crop up as a primary infection. The most effective treatment is formalin at 1,000 to 2,000 ppm for fungal infections of eggs and 1 to 3 ppm malachite green for 1 hour on fungal infections of fish.

Cardinal Rules

There are some cardinal rules to follow when treating fish with chemicals or drugs:

1) Begin treatment of cultured fish during early stages of infection or as soon as possible to reduce deaths.

2) If you feel uncertain about treatment levels for different species and ages, use a trial treatment first with a small sample of fish. Mistakes often are made by overdoses, resulting in deaths due to the treatment itself.

3) Drugs and chemicals used for treating fish meant for human consumption must be approved by the U.S. Food and Drug Administration. Currently only sulfamerazine, Terramycin, and formalin are registered.

4) Be careful of effluent containing drugs and chemicals after treatment. Do not contaminate the environment, because this may induce growth of drug-resistant strains in the field.

5) Keep records of all treatments and their effectiveness at your station. Individual environmental variations may require modification of prescribed treatments, and you may want to repeat treatments when trouble again occurs.