

of titres: 62 below 1:40 (95.4%), two of 1:40 (3%) and one of 1:80 (1.6%).

On the basis of these data, a preliminary model for evaluation of field serum titres has been set up.

The percentage of positive reactions in trout sera from VHS infected trout farms ranged between a few and fifty percent.

Although progress has been made, it is obvious that much work still has to be done before it is practical to use serological methods as the only method of surveillance for VHS control.

Most of the above results were published in Danish in April 1984.

EPIDEMIOLOGICAL STUDIES ON VHS IN A WILD FISH POPULATION

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Epidemiological studies on VHS were performed in a brook in the headwater region of which three lakes are situated that are used for sport fishing. Downstream, it supplies two fish hatcheries in which severe VHS outbreaks occurred in 1983. Upstream of the hatcheries a weir prevents migration of fish to the lakes.

The question arose whether the virus was introduced the previous year or whether VHS virus is endemic to the region. So the fish in the brook were examined for antibodies against VHS virus. From four stretches up and downstream of the hatcheries 120 brown trout were sampled by electric fishing. In the lakes, 13 pike were caught in the same manner. Blood samples were taken from all fish. To detect antibodies against VHS virus counter immunoelectrophoresis using a radiolabelled antigen was used.

The results show that VHS is endemic to this region. Upstream from the two hatcheries, 21% and 10%, respectively, of the brown trout contained antibodies against VHS. Downstream, 37% and 41%, respectively, of the trout were found to have antibodies. Antibodies were also detected in four of the 13 pike caught at three different sites in the lakes. Since brown trout with antibodies were found upstream of the weir (21%) it can be stated that VHS outbreaks in the two hatcheries were initiated by infected fish from the brook. This high percentage of fish containing antibodies a short distance downstream from the hatcheries (37% and 41%) indicates that the brown trout may carry VHS virus. The percentage of antibody-positive fish decreased from 37% to 10% within a distance of about two kilometres. The higher prevalence of positive trout near the farms suggest the

fish in the farms once infected are maintaining virus levels in the wild fish. These results indicate that VHS virus was endemic in the region prior to the VHS

outbreaks in the hatcheries in 1983. The danger of transmitting the disease from the brook into the hatcheries still remains.

ECONOMICALLY IMPORTANT PARASITIC DISEASES IN AQUACULTURE OF FISHES

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The various aquaculture systems for rearing fish are characterized by a number of factors and may be categorized as intensive, semi-intensive and extensive or according to habitat in natural systems such as rivers, lakes and marine waters. The systems regarded as natural normally show well balanced relationships between the fish and their parasite populations. Many parasite species are present but normally they have little pathogenic impact on their hosts.

A similar situation exists in semi-intensive and extensive fish farming, which employ mainly large natural ponds. Among such cultured species, (e.g. pike, tench, eel, ide) trout and carp are the most important. They suffer from a variety of parasites and the number of parasite species is the same as that encountered in natural waters, but the numbers of individuals per fish may be significantly higher. In carp fry and carp of the year, the protozoan parasites *Trichodina*, *Apiosoma*, *Chilodonella*,

Ichthyophthirius, *Ichthyobodo*, *Coccidia*, SBI-protozoa (*Csaba* parasites, SB-myxozoa, *Sphaerospora renicola*) may cause serious problems. For older carp, *Trypanoplasma* and *Trypanosoma* are also troublesome. In addition, the Monogenea (*Dactylogyrus* and *Gyrodactylus*), *Sanguinicola*, and tapeworms (*Bothriocephalus*, *Caryophyllaeus*, and *Khawia*) can often be found in large numbers. *Argulus* and *Piscicola* may transmit bacterial and viral infections. While *Branchiomyces* occurs mainly during the summer, *Ichthyocytrium* is found in the winter and early spring months. In older carp, parasite infections may be present, but they are less serious.

In trout farms, the same ecto- and endoparasitic protozoa may occur together with Monogenea and cestodes. *Scyphidia*, *Epistylis*, and *Trichophrya* may also occur and serve as indicators of the water quality. Among the cestodes, *Proteocephalus*, *Eubothrium*,