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The aims of the research

To provide information on the likely impact of new or emerging virus diseases and notifiable virus diseases (particularly VHSV, IHNV, SVCV) on wild fish and on the fish farming industry, encompassing species already cultivated, and new aquaculture species. Viruses causing notifiable diseases will be monitored for the emergence of new strains, so that we will continue to be able to identify them, and provide advice on changes relevant to their control, such as changes in the host range or virulence.

Significance of notifiable diseases to wild and cultivated species

Certain diseases, including the virus diseases viral haemorrhagic septicaemia (VHS), infectious haematopoietic necrosis (IHN) and infectious salmon anaemia (ISA) are so serious that they have been made notifiable. This means that MAFF must be informed directly or indirectly (e.g. via a veterinary surgeon) if the presence of such a disease is suspected. In order to maintain freedom from VHS, IHN and ISA there is a policy of slaughter of affected fish and disinfection of sites.

Studies on VHS and IHN viruses

VHS and IHN are present in many European countries and North America (and IHN is also present in Japan) and the VHS virus has also been isolated from marine species. They cause serious diseases in rainbow trout and other salmonids and the VHS virus was responsible for a disease outbreak in cultivated turbot in Scotland. Although VHS virus isolates from marine species are known to cause high mortality in marine species, under experimental conditions some of those isolates are avirulent or have low virulence for rainbow trout.



Studies are undertaken in the experimental tank facility at CEFAS Weymouth to determine the susceptibility of our native species to VHS virus and IHN virus.



Turbot rearing facilities have suffered disease outbreaks caused by VHS virus.

Questions

- Which of our native species are susceptible to the viruses?
- Which of our native species could become inapparent reservoirs of infection (carrier fish)?
- Can rapid diagnostic techniques for detection of the viruses be developed?

Studies on ISA virus

ISA affects salmon and for many years was confined to Norway. However, in the late 1990s the disease was reported in salmon from Scotland and Canada and in 2000 from the Faroe Islands and Chile. The virus has also been detected in sea trout and eels in Scotland. A survey of selected sites and river systems in England and Wales is being undertaken in 2000-2001, in parallel with a similar survey being undertaken by the Fisheries Research Services in Scotland.

Questions

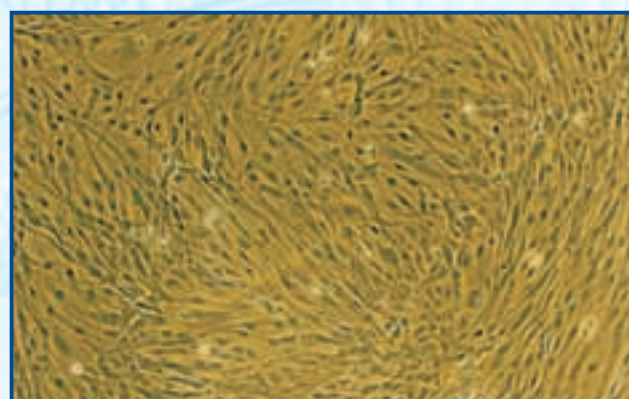
- Is the ISA virus present in salmon broodstock, sea trout, freshwater salmonids or eels in England and Wales?
- If so, is the virus the same as the Scottish ISA virus?



A Scottish Fish Health Inspector sampling salmon during the 1998 ISA disease outbreak.



The presence of ISA virus in cell cultures is confirmed by its ability to cause salmon red blood cells to attach to infected cells (shown on the left). The red blood cells have not attached to the non-infected cell culture (shown on the right).



Emerging virus pathogens

Viruses that have emerged as important pathogens in other countries around the world and in particular countries having trade links with the UK and viruses isolated from native or imported fish during routine CEFAS monitoring programmes.

The purpose of this area of research is to assess the impact of these pathogens for native fish and aquaculture species in the UK.

Questions

- Can we diagnose the disease and accurately identify the virus and where the virus is known to be highly pathogenic and/or easily spread can it be rapidly identified ?
- Do infected fish remain as virus carriers in the population and does the virus present a threat to other fish species ?
- Do environmental stress factors, current aquaculture practices or poor husbandry contribute to the impact of the disease ?
- Is the virus highly virulent for the target fish species and are all strains of the target species equally susceptible to the virus ?
- Is the virus prevalent in wild, fishery and farm fish populations ?
- Do the new virus isolates share any characteristics with related viruses from other fish species and could these viruses contribute to misdiagnosis of notifiable diseases?



Is the virus prevalent in native fish in coarse fisheries such as this one?

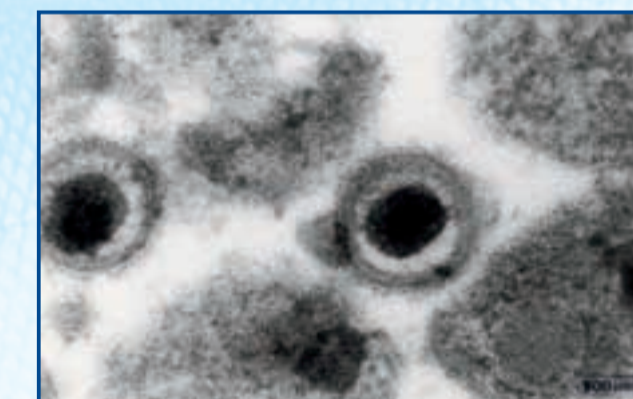
The role of pathogenic viruses in unexplained carp mortalities e.g Koi herpesvirus

Investigators in Germany, Israel and the USA report high mortality in diseased koi carp characterised by severe gill necrosis.

The herpesvirus has not yet been isolated from imported koi or from native carp in the UK. However, fish showing similar disease signs have been reported by UK koi importers who have experienced high mortality rates in re-circulation systems.



Koi carp are particularly susceptible to the koi herpesvirus. Are our native carp equally susceptible?



Herpesvirus particles visualised under the electron microscope.

Preliminary carp infection studies at CEFAS with a virus isolate from the USA suggest that native carp are susceptible to the disease.

It is hoped that the development of DNA probing techniques will improve detection of the virus in asymptomatic fish and could be particularly useful for examining archive material from previous unexplained mortalities for presence of the virus.

A rhabdovirus that has emerged as a potential threat to cyprinid fish species.

A rhabdovirus has been isolated during disease outbreaks in bream, tench, roach and crucian carp at 6 fishery sites in England in 1999.

The virus showed a close serological relationship to pike fry rhabdovirus and to a rhabdovirus isolated during a disease outbreak in bream in the River Bann, Northern Ireland in 1998.

Bream stocked at 5 of the 6 fishery sites were found to have originated from the river Bann.



Some tench exhibited a clinical disease similar to SVC with skin ulcers and haemorrhaging.



Environment Agency personnel electrofishing for wild cyprinid samples. Screening for the tench rhabdovirus at the six affected sites from 1999 was carried out in 2000.

Field observations together with experimental results indicate that the rhabdovirus is of low virulence but may have the potential to cause mortality in recently stocked fish that have suffered transport and handling stress.