Syncytial Hepatitis of Tilapia (SHT) – early diagnosis of TiLV, and advice for its control.

Professor Hugh W. Ferguson

St George’s University, Grenada, W. Indies

Guayaquil, Ecuador. R. Guayas
- 80% loss in one strain of tilapia ("chitralada").
- 10% loss in another recently purchased strain (genetically all male).

Mortality of >23 million/year in 2011/12

"Anasarca" = generalised oedema

Other clinical signs:
- anaemia (low Packed Cell Volumes)
- probably hypoproteinaemia (explaining the anasarca?). Resulting from a) damaged liver (low production) plus b) poor uptake & c) loss through GIT.
- some fish were dark and thin (survivors?)
Normal stomach

Loss of gastric glands -> poor digestion

Protein exudate within lumen of GIT – “protein-losing enteropathy”.

Hepatitis, showing increased lipids (brown) and early syncytia (arrow).
We published a paper on the pathology of this “new” disease and called it “Syncytial hepatitis of tilapia” (SHT) due to the very distinctive hepatic lesions.

We used the term “syncytia” to mean either fusion of cells, or failure of cells to separate properly.

NB - No brain lesions were seen in any Ecuadorian fish nor in tilapia that I examined from other S. American countries (Colombia etc)!

Work continued on the cause of SHT - - -
• Material sent to Dr Ian Lipkin, Colombia University, for viral discovery (high throughput sequencing).

• During initial work, 4 different viruses were found, but all were present in both sick and healthy fish. So they were dismissed as likely causes.

• Viral discovery work by Dr Lipkin then stopped due to lack of money. But transmission electron microscopy (TEM) work continued!!

- Initially all TEM work concentrated on livers with large syncytial cells – but no “obvious” viruses were seen. Disappointing!!

- Then I looked at the livers without large numbers of syncytia (early stage?).

  - Eureka!!

Liver from tilapia with SHT showing virus particles (arrow) free within space of Disse (SD). S = sinusoid.

Infected hepatocyte showing virions (arrow) within cytoplasm.
TEM images were forwarded to Dr Lipkin – “why can you find nothing”? He kindly agreed to continue with viral discovery work.

At the same time, a new virus of unknown identity was forwarded to Dr Lipkin by Israeli workers. The isolate came from diseased tilapia from Sea of Galilee.

Although the isolate itself had been sent, once again, nothing was identified on HTS.

Alarm bells started to ring in Dr Lipkin’s mind (equipment failure?) and material was sent to another laboratory just to check.

Finally high throughput sequencing gave a partial “hit” to one segment of human influenza type C. An orthomyxovirus

This then became known as Tilapia Lake Virus (TiLV).

• Primers to Tilapia lake virus (TiLV) were developed & within hours, these were used against the Ecuadorian material - SHT lesions were shown to be positive for TiLV.

• Conclusion: A new orthomyxovirus (TiLV) was probably the cause of SHT. And it had probably been imported onto the farm.

• Now of course SHT has been reproduced experimentally, and TiLV is accepted as the cause of SHT.
Advice to this farmer in Ecuador?

- Disease was seen at low prevalence (maximum 10-20%) in one strain of tilapia, and only in fry, so was a relatively inexpensive disease, and controllable genetically. **An amazing difference in susceptibility of different strains of fish.**

- Rather than work on a vaccine, therefore, a selective breeding programme was started.

Lessons?

1. Molecular methods may not be the best approach for new diseases. Indeed they can “miss” a diagnosis.

2. Just because molecular work gives negative results, do not assume your diagnosis was incorrect! **Persevere!**

3. “Old” technology (routine histopathology and electron microscopy) still has a place in diagnostic work, even though training takes a long time.

4. **More is missed by not looking than by not knowing!**
Questions?

Me