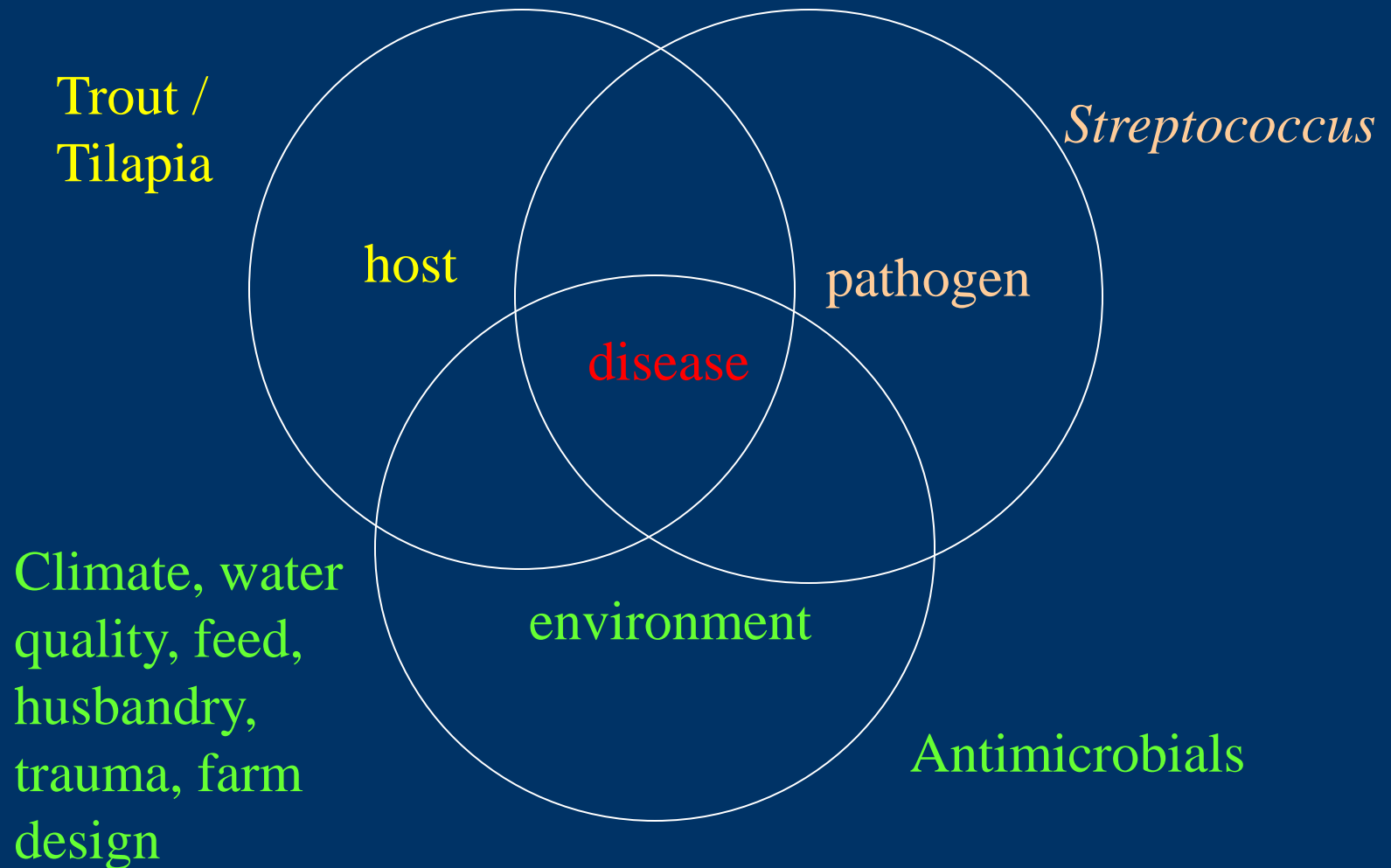


Lessons Learned and Future Approaches in Antimicrobial use in Aquaculture – Experiences with Streptococcosis in Southern Africa

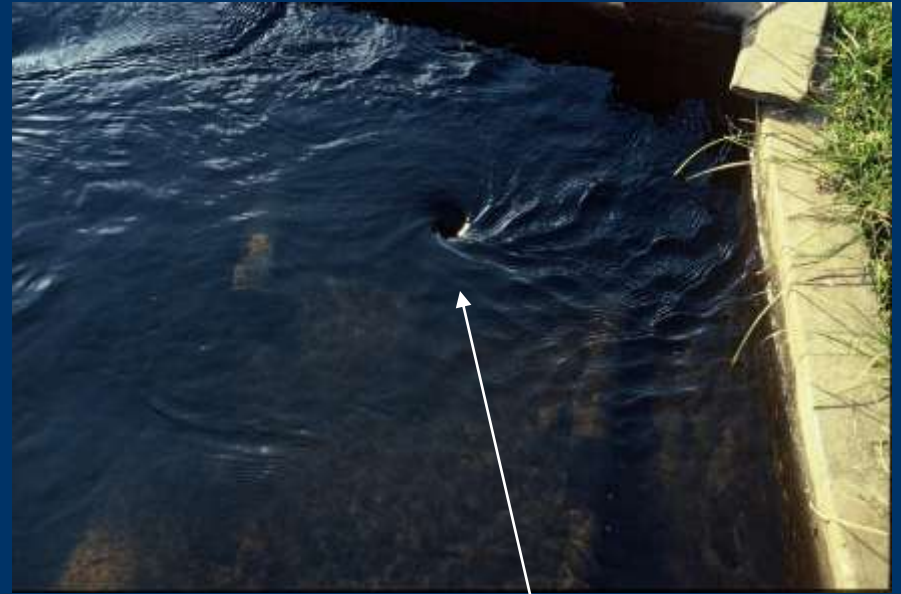
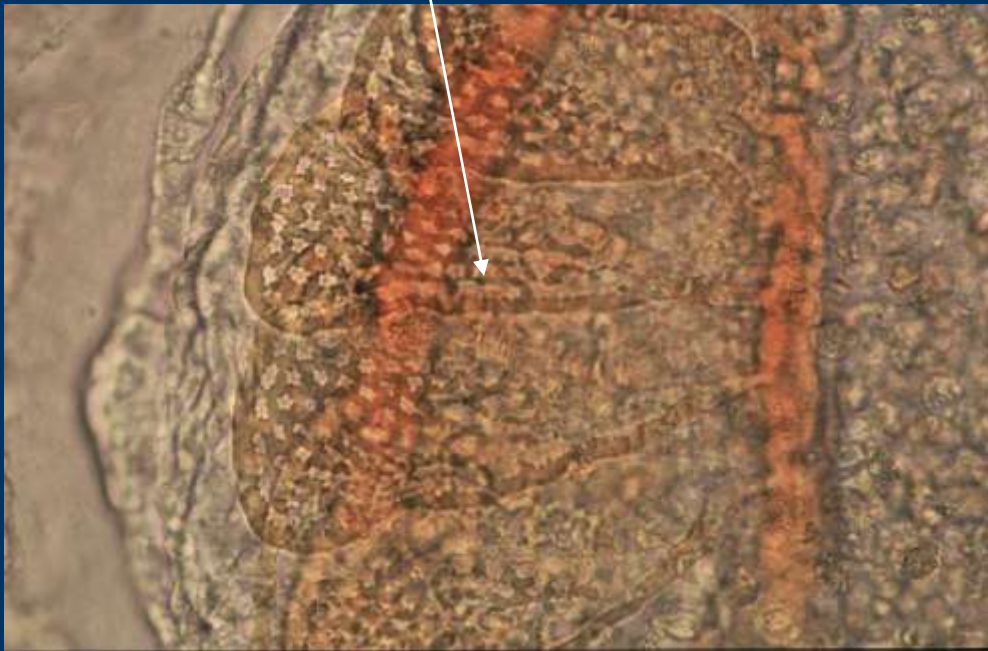
K.D.A. Huchzermeyer (Sterkspruit Veterinary
Clinic) and M.M. Henton (IDEXX Laboratories)



Multifactorial causes of fish disease



Healthy gill
microvasculature

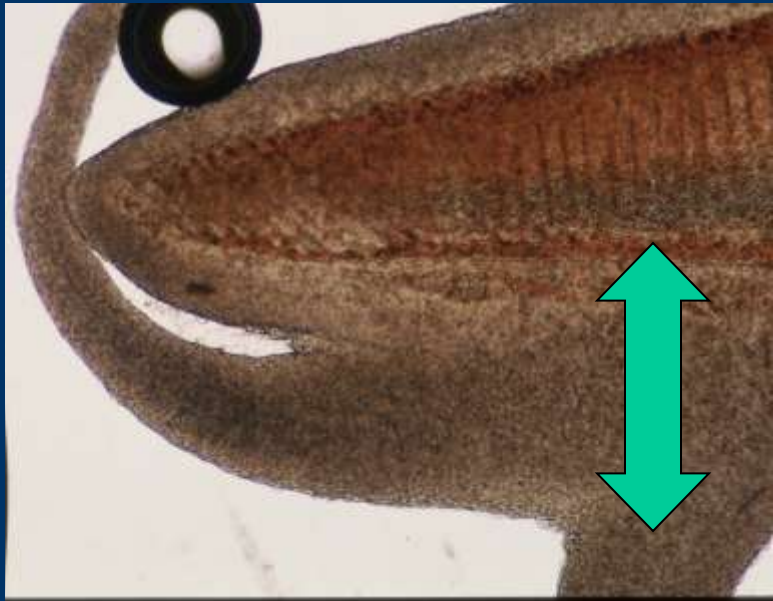


Vortex formation
feeding into a pipe –
one of many causes of
gas supersaturation

Gas emboli in gill – obstruct gill microvasculature



High pH - inability to excrete ammonia -
auto-intoxication – hyperplasia of gill epithelium -
increased oxygen diffusion pathway – fish unable to
extract sufficient oxygen from water



Intensive fish farming

- Large amount of organic waste favours growth of environmental bacteria
- High population density creates a suitable host population for opportunistic bacteria from the environment
- Sub-optimal environmental conditions provide a weakened host - selection pressure benefits more virulent opportunistic bacteria
- Repeated antibiotic use - selection pressure favours antibiotic resistant bacteria

Disease management

- Identify risk factors
- Limit losses – short term gain by using **antimicrobials**
- Optimize production
- Optimize husbandry
- Consumer concerns – **antimicrobial residues**
- Environmental concerns – development of **antimicrobial resistance**

With injudicious repeated use of antimicrobials

- Antimicrobial sensitivity declines in the pool of bacteria associated with the farmed environment
- Increasingly virulent strains of bacteria emerge
- Virulent fish-associated bacteria are moved with transport of live fish and threaten other producers

Gram positive, coccus shaped, non-haemolytic bacteria

- *Lactococcus garviae* / *Enterococcus seriolicida*
- *Streptococcus iniae*
- *Streptococcus parauberis*
- *Carnobacterium piscium*
- *Streptococcus D*
- Other *Streptococcus* species



Streptococcal infection of trout

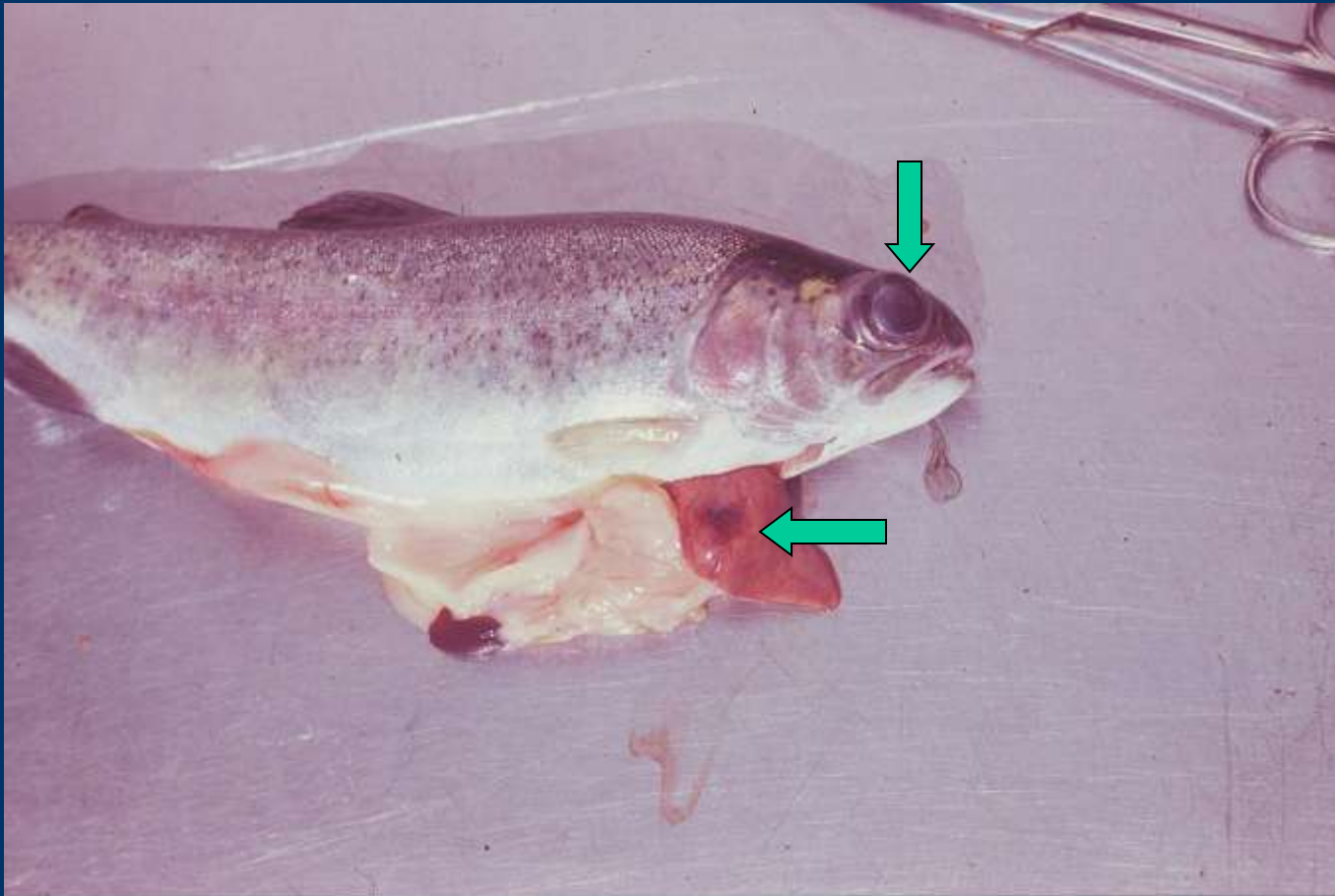


- Disease peculiar to South Africa
- First described from rainbow trout in 1974
- Important septicaemic summer disease
- Primarily an environmental disease related to stress factors
- Treatment with **oxytetracycline** resulted in suppression of disease but not in cure
- Emergence of resistance to oxytetracycline

Bacterial septicaemia



Streptococcus infection



Streptococcus septicemia in trout – precipitating environmental factors

- Low water flow and high water temperature
- High daytime water pH due to algal photosynthesis
- Ammonia build up in water and gills
- Low DO
- High dissolved gas pressure
- Build up of infective dose

During the early years of intensive trout farming in South Africa

- Bacterial isolates showed good sensitivity to a number of readily available antibiotics
- Antibiotics were repeatedly used during the summer months to control outbreaks of streptococcal disease
- Antibiotic use at best controlled losses from streptococcal infection but seldom achieved a sustainable cure
- **Oxytetracycline** was mainly used for cost and availability reasons.

More recently

- **Oxytetracycline** found to be no longer efficacious
- Most isolates still sensitive to **amoxycillin**.
- Fish responded well to amoxycillin with better cure rates than those achieved with **oxytetracycline**
- Already some *Streptococcus* isolates identified showing resistance to **amoxycillin**
- **Erythromycin** used elsewhere in the world but not in South Africa. Florfenicol not available as registered in feed medication for fish in South Africa
- Use of **autogenous vaccines** against streptococcosis is becoming more accepted with generally good results

Streptococcus infection in Nile tilapia in Southern Africa

- *Streptococcus iniae*
- *Lactococcus garviae*
- *Streptococcus parauberis*



Stocking density – trauma - cage size



Typical lesions
seen with
Streptococcus
infection in
tilapia



Inbalanced feeds – ascorbic acid and omega 3 fatty acids



Dissolved oxygen levels
Stocking density
Feeding practices



Lax enforcement of legislative controls
will promote the injudicious use of
antimicrobials to the detriment of

- the consumer
- the environment
- sustainable
aquaculture



Sourcing of antimicrobials

- According to antimicrobial sensitivity of isolates from disease outbreak
- Antimicrobial registered for use in aquatic animals for human consumption – none in South Africa
- Off-label use on veterinary prescription
- The script may be from the aquatic veterinarian involved with the disease outbreak or from a generalist veterinarian supplying bulk scripts
- Availability and cost of the drug influences choice.
- Often raw active drug intended for manufacture of human and veterinary drugs is sourced

Use of antimicrobials in South Africa

- legal / illegal

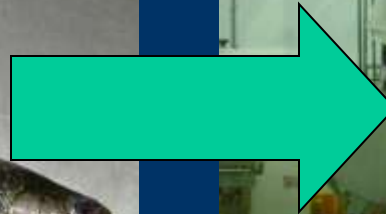
- Most antimicrobials are supplied by an aquatic veterinarian or under veterinary prescription for the first time
- **The responsible veterinarian loses control of antimicrobial use when:**
 - Farmers look for cheaper suppliers – often directly from wholesalers or importers or from other sectors of the livestock industry.
 - Antimicrobials supplied without script or on blanket script from a veterinarian not involved with fish.

Who decides when to treat?

Farmer or veterinarian

- Aquatic veterinarian may supply antibiotic to see fish through a crisis while underlying causes are addressed
- Farmer may be unwilling or unable to make recommended changes and rather sources further antibiotic without veterinarian's knowledge to safeguard his investment
- Repeated injudicious use by the farmer leads to selection of antimicrobial resistant strains predominating on the farm

Do antimicrobials have a place in modern aquaculture?



Intensive farming creates environments conducive to emergence of bacterial pathogens



Future of antibiotic use

- If used judiciously, antibiotics will continue to play a crucial role in seeing fish through times of unanticipated environmental conditions
- Antibiotics should not be used to bridge nutritional and husbandry shortcomings that can be solved in more appropriate ways
- Where possible vaccination should be used to control bacterial disease

Farmers can curtail emergence of bacterial pathogens by:

1. Identifying and understanding underlying causes
2. Following good bio-security practices



**but NOT by
reliance on
antibiotics**