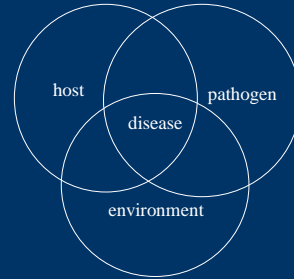


## PRACTICAL BIOSECURITY AT FARM LEVEL AND PRIORITIZING RISK

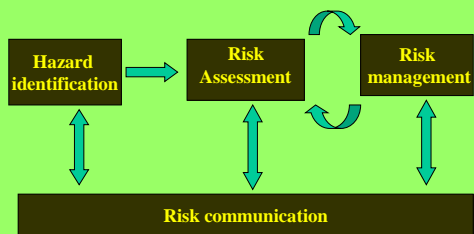


David Huchzermeyer Sterkspruit Veterinary Clinic

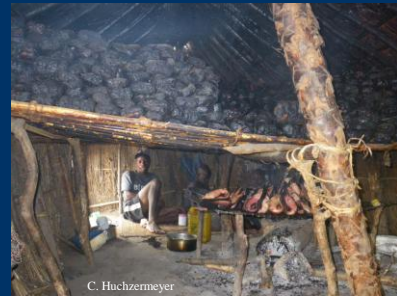
## Multifactorial aethiology of fish disease – hazard identification



## Risk analysis



## Traditional commercial flood plain fishery



C. Huchzermeyer

## Infectious disease

- Pathogenic organisms can be transmitted much more easily through water than through air
- Some serious pathogens can be transmitted vertically through the gametes
- Asymptomatic carrier states exist for the majority of fish pathogens

## Epidemiological risk factors

- Carrier state – e.g. KHV in koi
- Reservoirs of infection – e.g. retail outlets for koi
- Vectors – e.g. KHV – goldfish, wild fish - EUS
- Immune status of the fish – e.g. KHV in koi
- Genetic resistance – e.g. koi varieties - KHV
- Age
- Sex

## Risk of introducing infectious disease

- Source of infectious agent.
- Transmitted or introduced by:
  - purchased eggs and fish,
  - birds and their faeces
  - humans visiting or working on the fish farm
  - transport vehicles
  - farm equipment
  - wild or feral fish
  - infected water source



## General sanitary prophylaxis

- Purchase eggs from disease free farms
- Avoid purchase of live fish, where unavoidable purchase fish from disease free farms
- Quarantine fish introductions for minimum of 2 weeks
- Restrict visitors, disinfection - foot wear, waders where these have been used off farm and between ponds during disease outbreaks.
- Same applies to employees and veterinarians visiting farms.
- Disinfect returning delivery vehicles and farm equipment



## Further control measures




- Divide farm into epidemiological units
- Restrict movement of staff and equipment between epidemiological units
- Optimize stocking density
- Optimize water quality
- Optimize cleaning and disinfection
- Stock fish from source with known health status
- Avoid mixing fish from different sites

## Disease outbreak - general husbandry practices

- Legislative and husbandry measures restricting movement of fish
- Mandatory regulations covering:
  - Health control
  - Transport
  - Slaughter house practices



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## In an outbreak situation consider

- Implement legislative control measures
- Strict quarantine
- Movement control
- Destruction of all infected and exposed fish
- Thorough cleaning and disinfection of equipment and site
- Effective carcass disposal

## Disease outbreak - specific husbandry measures

- Restrictions on affected, suspected and neighbouring farms
- Enforced sanitary slaughtering
- Generation segregation
- All-in-all-out stocking
- Disinfection of slaughter house and processing plant waste and waste water
- Restock with pathogen free fish

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## Prioritising diseases

- Assurances needed for trade
- Resources of the country
- Financial impact or threat posed by a disease
- Importance of industry wide disease control programme within a country or region

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## Disease management

- Identify the biological pathway of the risk
- BIOSECURITY PLAN AND SOP'S

- Limit losses, identify critical control points
- Optimize production
- Optimize management
- Consumer concerns
- Environmental concerns



SUSTAINABLE  
AQUACULTURE  
PRODUCTION

## Damage to gills sets off a chain reaction

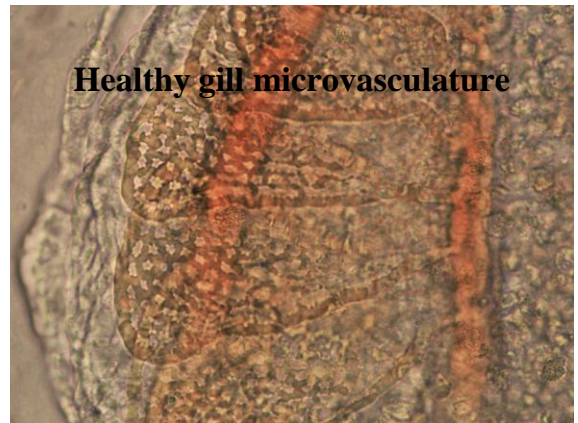


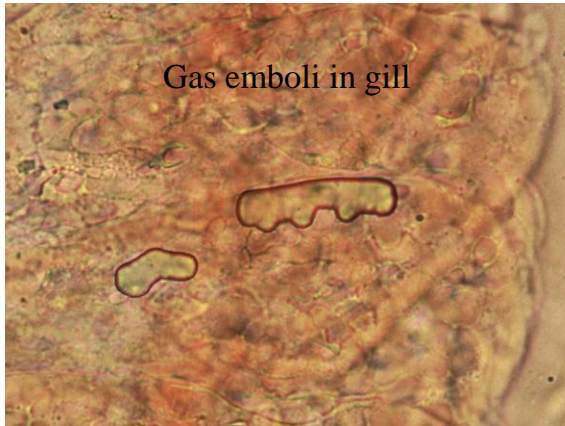
## Environmental factors underlie gill damage

- High water temperature
- Silt
- Supersaturated gas pressure
- High pH – algal photosynthesis
- Chemical damage
- Low dissolved oxygen



## Healthy gill microvasculature



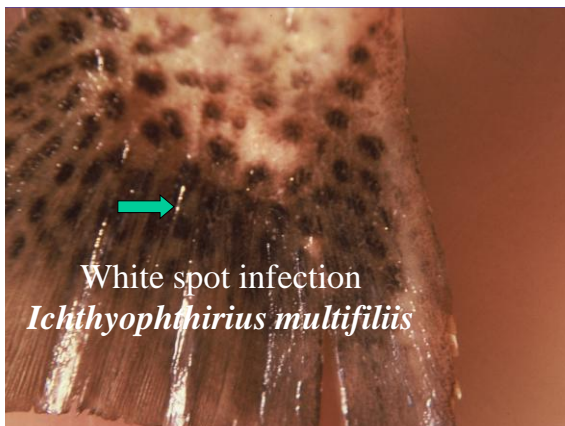


**Parasitic infection – multifactorial?**

- Infection endemic in the farmed population or exotic
- Role of immunity
- Water temperature
- Factors in the feed
- Interaction between wild and farm populations

Exotic fishes have been introduced into Africa since the days of early settlers

- With a long list of diseases that were introduced with these imports
- Many of the parasites that impact on wild populations of fish as well as on farmed fish were inadvertently imported with exotic fish. Most of these parasites are nowadays regarded as ubiquitous with no control measures





## Ichthyophthirius

- Endemic on farm year round
- Immunity to reinfection solid
- Controlled exposure in winter
- Speed of water flow.
- Infective stages swim at 3,2 mm per second



## Streptococcus infection of salmonids

- *Lactococcus garviae* and other gram positive enterococci including a unique group of streptococci of the Lancefield D group
- A bacterial septicaemia causing serious losses periodically on trout farms
- Appears to be an environmental opportunistic pathogen at water temperatures above 18° C
- Linked to certain environmental factors

## Streptococcal septicaemia

- Low water flow
- Algal photosynthesis
- High daytime water pH
- Ammonia build up in water and gills
- Low DO
- High dissolved gas pressure
- Build up of infective dose

New diseases have emerged under burgeoning aquaculture in many parts of the world. Africa has in many instances remained remote from these developments and as a consequence many of these diseases were not introduced into Africa.



## International movement of salmonid fish is tightly regulated

- Adherence to strict import regulations and disease surveillance testing has in the case of RSA kept feared salmonid diseases out of the country
- Effective diagnostic and regulatory capacity has enabled RSA to export certified disease free salmonid ova to the lucrative northern hemisphere market



## KHV



- **Koi herpes virus (KHV)** is an emerging viral disease of carp (*Cyprinus carpio*) in all of its varieties
- First officially identified in 1998.
- Examination of archive material indicates KHV presence as early as 1996
- Worldwide distribution
- Unregulated international trade of ornamental carp (Koi)

## Need for certified pathogen free fish

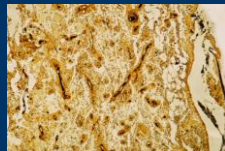
- Difficulty of identifying carrier fish
- Unquantifiable risk associated with naturally resistant fish
- Unquantifiable risk associated with KHV survivors
- Unquantifiable risk associated with 'vaccinated fish'

## Epizootic Ulcerative Syndrome

- First cases reported from upper Zambezi and Chobe rivers in 2006
- Diagnosis confirmed in 2007
- Botswana, Namibia, Zambia, Zimbabwe and now South Africa affected
- Major threat to fish diversity in this region
- Major threat to aquaculture development in these countries
- Threat to export potential from this region
- Originated in the Far East and has slowly been spreading westwards with cross border movement of live fish.

## Epizootic ulcerative syndrome

- *Aphanomyces invadans*
- Primary pathogen
- No host specificity
- Affecting both fresh and estuarine warm water fish.



## RISK

- Serious impact on local fisheries
- More than 130 species of fish at risk
- Major threat to indigenous and aquaculture fish in the entire Southern African region
- Threat to endemic fish populations

## Can countries protect fish and fisheries?

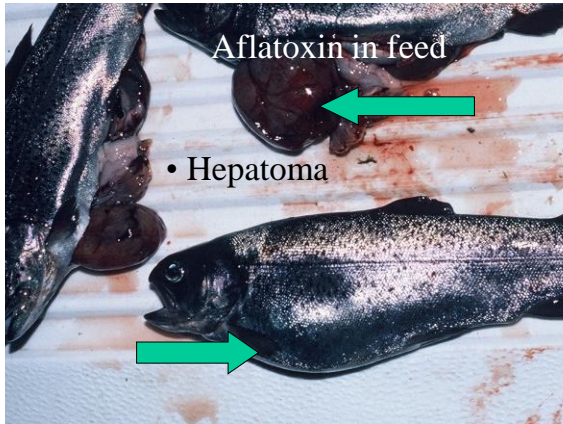
- Need to develop capacity to identify *A. invadans* by PCR. Currently South Africa and Zambia have the capacity
- Train field personnel
- Promote awareness amongst politicians, conservation agencies, border control officials
- Responsibility of state veterinary services
- Implement steps to limit cross border and regional risk posed by recreational and subsistence fishermen



## Co-operation with neighbouring countries

- Build contacts with neighbouring countries
- Encourage monitoring
- Share information
- Share regional control strategies





## Consumer concerns about carcinogens

- Aflatoxin and feed storage
- Aflatoxin in raw materials



## Consumer concerns about toxins



- Botulism

## Quality assurance

- **Chemical treatments**
  - malachite green
  - benzalkonium chloride
  - formalin
- **Antibiotics**
  - oxytetracycline
  - amoxycillin
- **Hormones**
  - methyltestosterone

## Act 101 of 1965 Medicines and Related Substances Control Act

- Governs use of antibiotics and hormones. Available on prescription from the consulting veterinarian only. Animals for which he prescribes an Act 101 drug must be under his direct care.
- The Act is administered by the medicines Control Council which have an inspectorate.

## Act 36 of 1947 Fertilizers, Farm Feeds, Agricultural and Stock Remedies Act

- Act 36 – Over the counter (OTC) medicines
- no registered fish medicines currently available
- Chemicals and disinfectants used to treat fish need to be registered under Act 36 if intention is to use them for disease control. Failing this they fall under legislation governed by Act 101 and become off label prescription drugs

## Act 54 of 1972 Foodstuffs Cosmetics and Disinfectants Act

- Controls any residues in foodstuffs
- Administered by the SABS
- Disinfectants not used for disease control are registered under this Act
- The Act is reactive where traces are identified in food. Involves the Department of Health
- If a farmer uses a chemical that is not registered or contrary to label instructions he can be prosecuted

## Farm protocol and quality assurance

- Regular involvement of the vet
- Minimum of one farm visit every 6 months?
- Keep vet up to date with all chemicals in use on the fish
- Use vet to set up treatment protocols and SOP's for the common problems on the farm
- **Regular revision of SOP's and biosecurity plan**



Thank you

