Fish Vaccination

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World Capture Fisheries and Aquaculture (including plants) Production (mt)

200mt in 2015!

- Capture production
- Aquaculture

- 94mt in 2015!
Feeding the 9 Billion!
Following its recent trend, world aquaculture would grow 4.5 percent per year from the mid 2010s to mid 2020s. However, to bridge the demand-supply gap, world aquaculture should grow at 9.9 percent per year until mid 2020s.
Can we achieve this?
Issues and Challenges

- Reducing disease risks
  - Diagnostics, vaccines, high health seed and resistant strains
  - Emerging diseases!
VACCINES
VACCINES

- Recognised as an impotent tool for prevention and control of bacterial fish disease

- First vaccines in early 1980s
  - *Vibrio anguillarum* - Vibriosis
  - *Yersinia ruckeri* - ERM
  - *Aeromonas salmonicida* - Furunculosis
Today over 25 vaccines commercially available

- Monovalent vs. Multivalent
- Salmonid heptavalent vaccines:
  - *Listonella (Vibrio) anguillarum*  
    - V. salmonicida
  - *Moritella viscosa*
  - Hitra disease
  - Furunculosis
  - *Aeromonas salmonicida*
  - Winter ulcer disease
  - Infectious pancreatic necrosis virus (IPNV)

- 99% reduction in the use of antibiotics in salmonids!
VACCINES

- Wide range of species:
  - Atlantic salmon
  - Rainbow trout
  - sea bass (*Dicentrarchus labrax*)
  - sea bream (*Sparus aurata*)
  - tilapia (*Oreochromis niloticus/mossambicus*)
  - amberjack (*Seriola dumerili*)
  - yellowtail (*Seriola quinqueradiata*)
  - catfish (*Ictalurus punctatus*)
  - Vietnamese catfish (*Pangasianodon hypophthalmus*).
Types of vaccines

Commercial vaccines from inactivated bacterial pathogens, fewer viral vaccines, none against parasites.

Mainly formalin killed whole cell vaccines

Live attenuated bacterial vaccines – *Edwardsiella ictaluri* and *Flavobacterium columnarae*, Channel catfish and one viral vaccine (KHV for Carp in Israel)

a DNA vaccine against infectious haematopoietic necrosis (IHN) is licensed in Canada for use in Atlantic salmon

one commercial subunit vaccine (peptide; VP2) used in Norway (against IPNV)

one recombinant vaccine against infectious salmon anaemia, ISA in Chile.
MERCK Animal Health

NORVAX® Minova 6: Inactivated, multivalent vaccine against furunculosis, classical vibriosis, coldwater vibriosis, wound disease and infectious pancreatic necrosis (IPN) for intraperitoneal injection in Atlantic salmon.

AQUAVAC® Strep Sa 2: Vaccine for the active immunization of susceptible fish species to reduce mortality and disease due to Streptococciosis caused by Streptococcus agalactiae.

AQUAVAC® ERM (ORAL): Inactivated vaccine against Enteric Redmouth Disease caused by Yersinia ruckeri (Hagerman strain) in rainbow trout (Oncorhynchus mykiss). Available as an immersion vaccine as well as an oral administration vaccine.

AQUAVAC® VIBRIO: Inactivated vaccine against vibriosis caused by Vibrio anguillarum serotype O1 and O2∞ (V. ordalii) in rainbow trout (Oncorhynchus mykiss) and European sea bass (Dicentrarchus labrax).
There a number of important considerations for the use of vaccines in fish:

- fish species
- status of the immune system
- production cycle and life history
- when the diseases occur
- farming technology (handling, mechanisation etc.),
- environment (e.g. temperature, salinity)
- stress factors
- nutrition and cost benefits.
There a number of important considerations for the use of vaccines in fish

Guidelines on the use of fish vaccines are provided by Responsible Use of Medicines in Agriculture Alliance (RUMA, 2006).

Fish differ from mammals in that they lack bone marrow and lymph nodes.

The major lymphoid tissues in teleost fish are the (head) kidney, thymus, spleen and mucosa-associated lymphoid tissues, including the gills, skin and nostrils.
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- Vaccine administration
  - Injection
  - Immersion
  - Oral

- Research on adjuvant efficacy
VACCINES

- **Non-fish vaccines**
  - Crustaceans (shrimp) are a very important species group in aquaculture with regard to value and volume.
  - There has been some research effort on the development of shrimp vaccines.
  - The mode of action of these is not fully known and it is thought that they could simply be stimulating the shrimp rather than vaccinating them as such.
  - Development of SPF/SPR stocks are currently providing some hope against various viral pathogens but complete protection in open systems is currently not possible.

- HPND management
VACCINES

- In summary
  - Vaccines reduce AMU!
  - However, in tropical aquaculture, it is unlikely that vaccines will significantly be able to reduce AMU over the next two decades!
  - An integrated approach is necessary.
  - Improved biosecurity, clean and healthy seed, good husbandry management, better regulation of AMU, and improved AAH governance and responsible movement of live aquatics could reduce AMU in tropical aquaculture.
Thank You!