

Biosecurity in RAS systems

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Outline

- ▶ Biosecurity
- ▶ Special considerations for RAS



Source: AKVA.com

Biosecurity

Infectious Disease Components

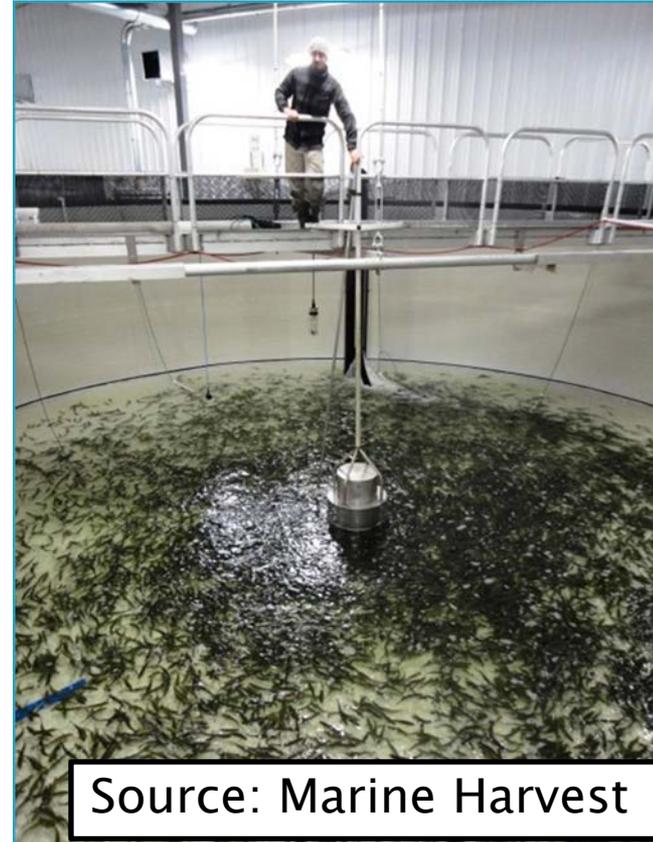
1. **Bioexclusion**
 - Prevention of pathogen entry
2. **Biocontainment**
 - Management of pathogens within a facility
3. **Biocontainment**
 - Prevention of pathogens release



Source: anonymous

Biosecurity analysis

- ▶ Scenario
- ▶ Pathogens/diseases of concern
- ▶ Control points
- ▶ Mitigation measures



Source: Marine Harvest

Physical layout – RAS



Source: google.com

Bioexclusion

**STRICT BIOSECURITY MEASURES IN EFFECT
DO NOT ENTER**



UNAUTHORIZED ENTRY PROHIBITED
THIS CRITICAL CONTROL POINT FORMS PART OF A
COMPLETE BIOSECURITY PROGRAM

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RAS Pathogen entry

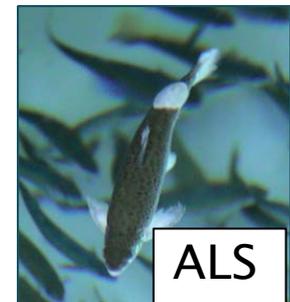
<u>Route</u>	<u>Details</u>
Animals	Live fish, dead fish (and components) and live/dead eggs
Water	Incoming (influent)
Fomites	Equipment (large and small), clothing
Vectors	Biological –pathogen life cycle Mechanical – incidental carriers (<u>staff</u> , visitors, predators, pests)
Feed	Pathogen not inactivated
Biofilter/biofilm	RAS

RAS - additional considerations



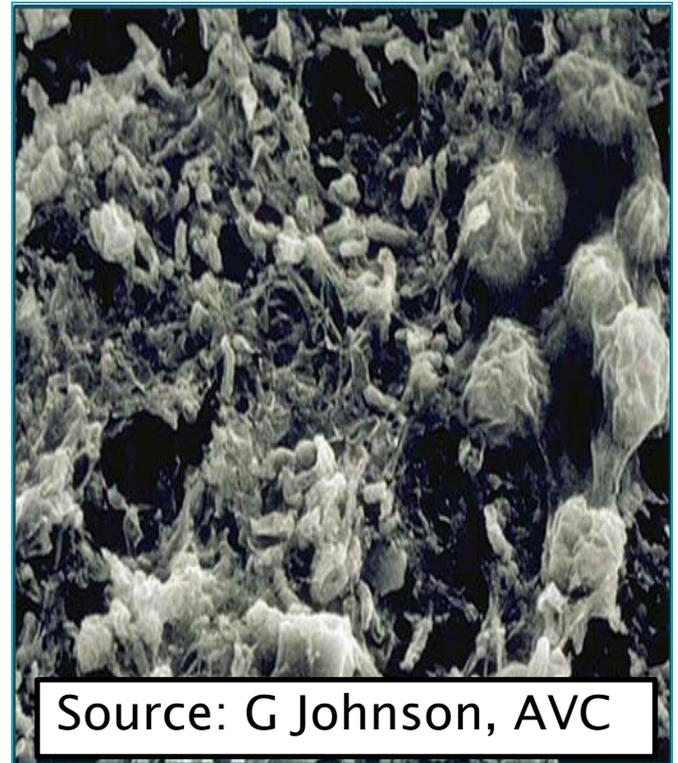
RAS – emerging diseases

- ▶ Pathogens that are ubiquitous or commensal organisms
 - *Saprolegnia spp* in Atlantic salmon hatchery RAS
 - *Francisella noatunensis* in Tilapia RAS
- ▶ Persistent, sporulated, intracellular organisms
- ▶ Occult entry into RAS through water or fish GI, gills, mucous?
 - Not screened for



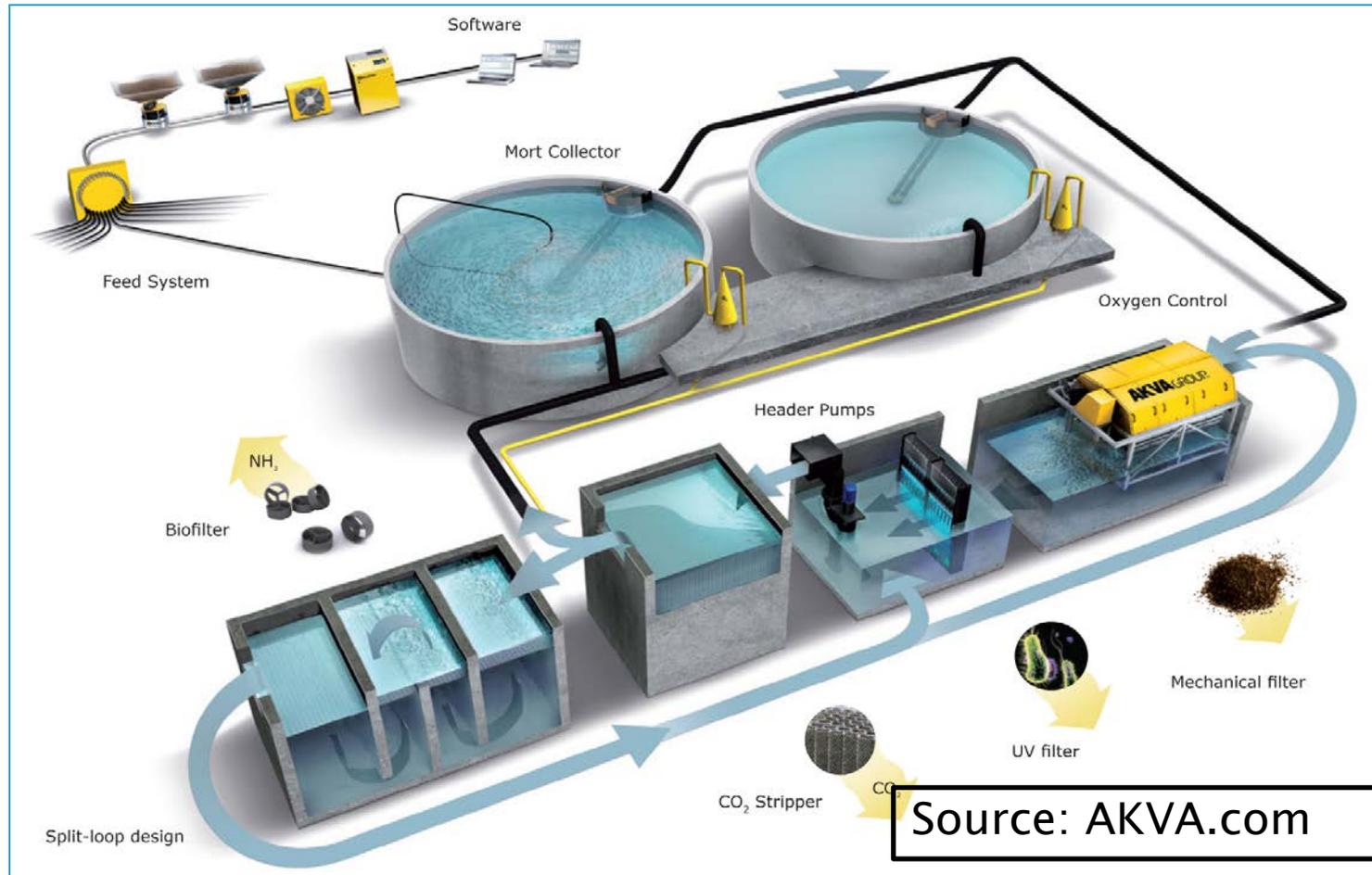
RAS – complicates infectious disease management

- ▶ Biofilter start up
- ▶ Biofilter at risk with certain flow-through treatments
- ▶ Development of reservoirs
 - Lack passive management through new water (dilution)
- ▶ Biofilm maturation – shedding and sequestration



Source: G Johnson, AVC

Biofilter and biofilm (B&B)



Managing disease by managing the RAS environment

- ▶ Change of tactics
 - Focus on biomanagement as well as bioexclusion
 - Importance of biofilm
- ▶ Characterize microbial populations in B&B
 - Metagenomics
- ▶ Cleaning the entire system “in vivo”
- ▶ Physical access to all parts of the system
 - Inspection and sampling ports

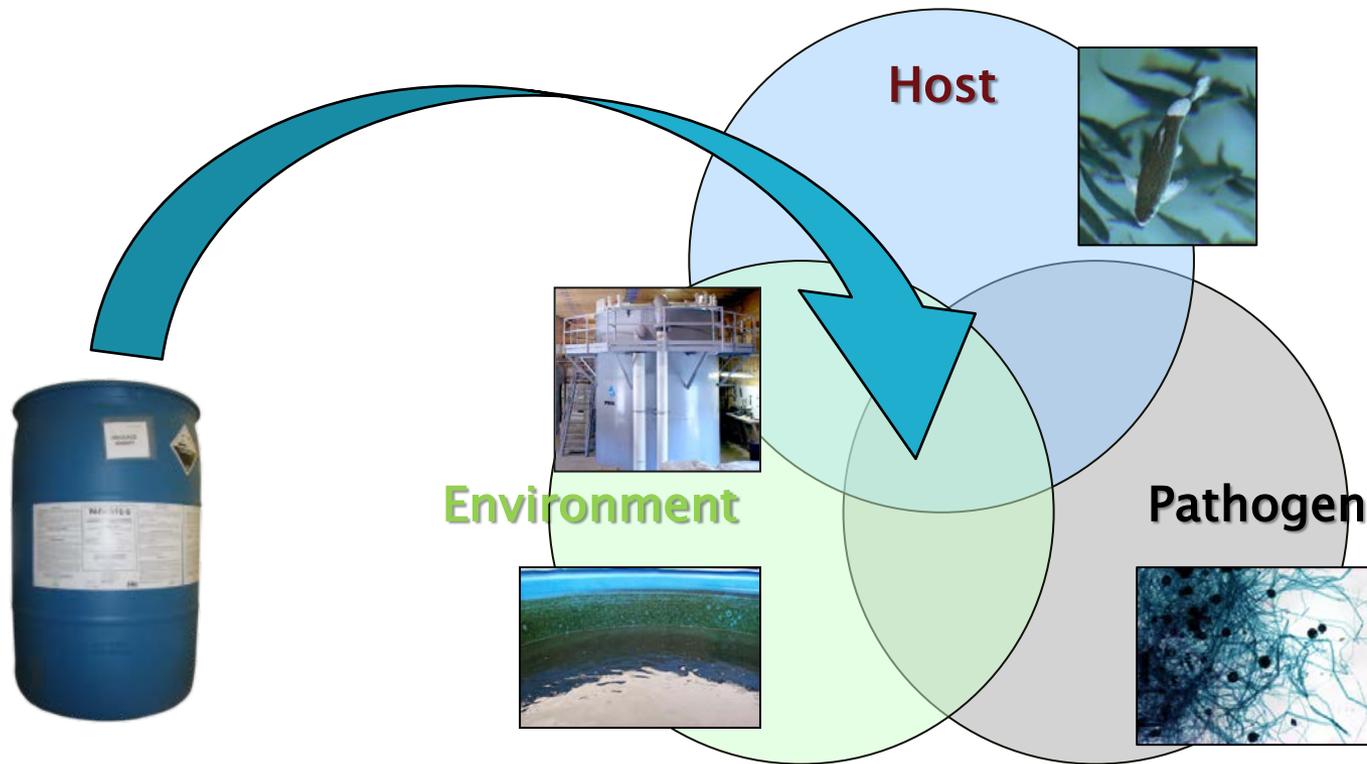
Managing disease by managing the RAS environment .../2

- ▶ Redundancies, plumb in parallel and bypasses for isolation, C&D, treatments
- ▶ Modularize the system
- ▶ Targeted in-water treatments for water, B&B
 - Chemical
 - Biological (e.g., phages)



Developing our understanding

- ▶ Solutions for the ENTIRE system –include B&B



Developing our understanding

- ▶ Multidisciplinary team
- ▶ New approaches
- ▶ New treatment regimes
- ▶ Incorporate lessons from agriculture
 - Livestock
 - Crops



Source: PRAqua

Questions?

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