Facility Level Development of Biosecurity Best Practices

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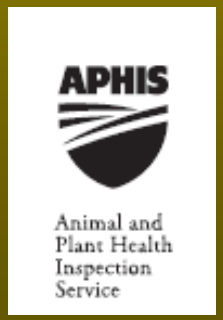
at

Southern Division AFS Spring Meeting

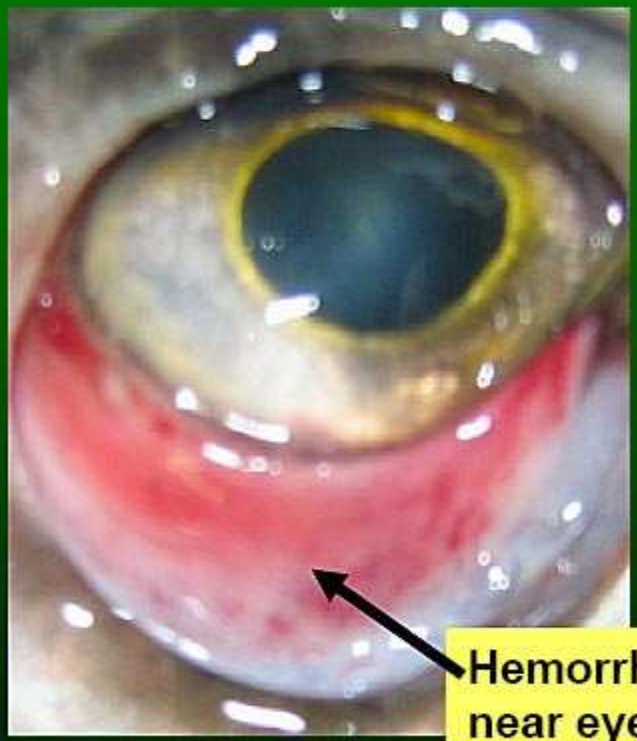
February 27, 2010



VHS Clinical Signs

Photos from Dr. Mohamed Faisal, MSU

Hemorrhagic areas on skin – Gizzard Shad, Lake St Clair



Hemorrhagic areas near eye – Yellow perch, Lake St. Clair

It's The Right Thing To Do: Code of Conduct

Companies and individuals engaged in aquaculture shall take all reasonable steps to:

- Avoid disease outbreak among culture species, between local farm sites, and across geographic areas.
- Ascertain that permissible introductions of exotic species are done in a responsible and acceptable manner and in accordance with appropriate regulations

World Health Organization OIE

- Comprised of 174 Member Countries and Territories
- Maintains permanent relations with 36 other international and regional organizations
- Regulate through Aquatic Animal Health Code
  - Assure the sanitary safety of the international trade of aquatic animals
  - Competent Authorities determine health measures

Federal Regulations

- Federal: USDA-APHIS, USFWS, USEPA, FDA
  - USDA-APHIS; Issue Federal Orders
  - USFWS; Lacey Act
  - USEPA; Clean Water Act
  - FDA; Food, Drug and Cosmetic Act

State Laws and Codes

- Fish and Aquatic Life Code
- Exotic Weed Act
- Injurious Species
- Sport Fishing Regulation
- Culture, Transport, Stocking, Import & Possession of Aquatic Life
- Viral Hemorrhagic Septicemia
- Chemical Fish Removal

Biosecurity

- Practices, procedures and policies to prevent introduction and spread
  - Infectious diseases
    - Microorganisms
      - Bacteria, viruses, fungi
    - Parasites
  - Aquatic invasive species
    - Zebra mussels, rusty crayfish

Benefits of Biosecurity

- Reduce risk of disease introduction
- Minimize spread on-farm or to new areas
- Promote fish health
- Protect economic investment
  - Reputation
- Protect against new diseases
  - Viral hemorrhagic septicemia
- Protect human health
  - Zoonoses, Food safety

***Mycobacterium marinum* lesion**

This disease may be an occupational hazard, particularly in the pet shop and aquarium business.

Biosecurity Plans

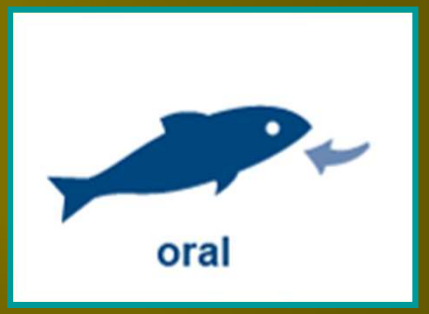
- No “one-size-fits-all” solution
  - Varies with type of operation, species, life stage reared
- Range
  - Simple and quickly implemented
    - Foot dips; disinfection; signs
  - Significant financial investment or effort
    - Dedicated quarantine equipment or facilities
- Cost-Benefit Optimization

Biosecurity Principles

- Identify Hazards
  - Understand disease transmission
  - What are the risk factors for your farm
- Assess Risks
  - Impacts to your farm
- Determine biosecurity measures needed
  - Prioritize – benefit, cost, practicality

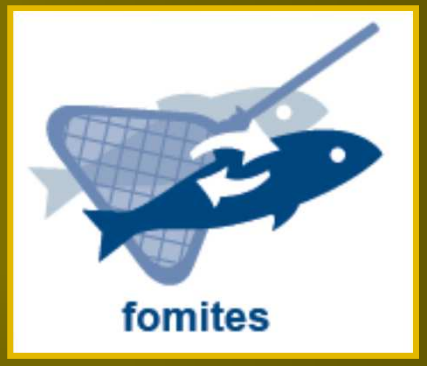
Disease Transmission in Fish

- Direct contact between fish
  - Vertical or horizontal
  - Entry through skin, open wounds, gills
- Ingestion (oral)
  - Infected live or frozen fish
  - Cannibalism of dead or dying fish
  - Contaminated feed



Disease Transmission in Fish

- Water Sources
  - Inputs, transfer
  - Including aerosols
    - Spray or splashes between tanks
- Fomites: Inanimate objects
  - Equipment: Nets, buckets, siphon hoses
  - Footwear, clothing, vehicles



Disease Transmission in Fish

- Vectors: Living creatures
  - Predatory birds, wildlife
  - Pets
  - People
- Zoonotic: affects people
  - Bacterial agents
    - *Mycobacterium*
    - *Edwardsiella*
    - *Erysipelothrix*
    - *Klebsiella*

Prevention: Fish Movement

- Purchase Healthy Fish
  - Known or trusted suppliers
  - Inspected, health certification, tested free of important diseases
  - Specific pathogen free (SPF) broodstock
  - Limit number of sources
  - Limit frequency of purchases
  - Vaccinate newly acquired fish

Prevention: Incoming Fish

- Quarantine new or returning fish
  - Time varies - 4-6 weeks
  - Maintain quarantine area separate from rest of farm, including
    - Water sources or flow circuits
    - Equipment
    - Effluents
  - Care for quarantined fish LAST or by a designated employee

Risk Factor: Fish Health

- Disease
  - Direct loss: deaths, illness
  - Indirect loss: decreased production
    - Reduced growth rates
    - Reduced feed conversion efficiency
    - Reduced product quality
- Optimum health of fish
  - Improves ability to fight off infection

Prevention: Fish Health

- Minimize stress
  - Acceptable stocking densities
  - Minimize frequent transfers between units or farms
  - Use gentle fish handling methods

Prevention: Fish Health

- Maintain optimum water quality
  - Avoid fluctuation
  - Can predispose or compound disease
- Monitor temperature
  - Avoid fluctuations
  - Lower temps affect fish immune systems
  - Some pathogens have optimum temperature range

Prevention: Fish Health

- Provide proper nutrition
  - Avoid nutrient deterioration
    - Store feed in cool, dry place
    - Use within 3-6 months
  - Keep vectors out of feed
    - Store in secured area
    - Clean up spilled feed
  - Obtain live feed from reliable sources

Prevention: Fish Health

- Monitor fish frequently
- Remove dead or dying fish
  - Humanely euthanize
  - Dispose
  - Prevent predator access
- Remove & isolate sick fish
  - Separate isolation facilities
  - Handle after resident fish or assign employee
- Diagnostic testing
  - Contact your veterinarian or fish health specialist

Prevention: Fish Health

- Keep accurate records
  - Fish illness, death
  - Growth
  - Feed conversion ratios
    - Helps detect subtle or sudden changes
  - All introductions, fish sources, fish movements on or off farm
    - Identify potential disease entry points
  - Treatments or vaccinations
  - Prior disease situations

Fomites: Equipment

- Pathogens can survive in the environment
  - Variable time
- Movement of contaminated equipment
  - Nets, buckets, hoses
  - Boots, waders
  - Tanks, raceways
  - Vehicles

Prevention: Fomites

- Cleaning & Disinfection
  - Allow necessary contact time
- Foot dips
  - Change solution daily or when visibly soiled
- Boots/waders
  - Submerse and clean
  - Allow necessary contact time

Risk Factor: Vectors

- Wild fish
- Predators
  - Birds and wildlife
- Rodents
- Domestic animals
  - Dogs and cats traveling between farms
- People
  - Employees and Visitors

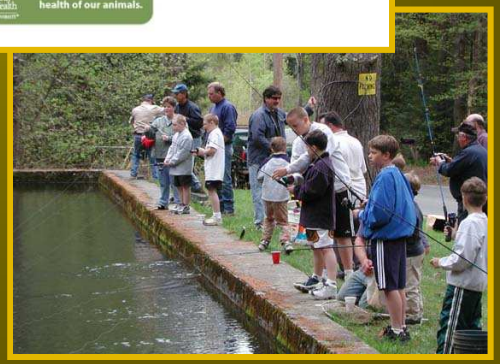
Prevention: Vectors (Animals)

- Limit contact
- Minimize bird nesting sites
- Implement predator and rodent management programs

Prevention: Vectors (People)

Farm Visitors

- Post signs
- Maintain a visitor log
- Use foot dips/baths for shoes
- Accompanied by farm personnel
- Avoid animal areas



Prevention: Vectors (People)

- Employees
  - Wear clean clothing or coveralls
  - Use foot dips
  - Wash or sanitize hands before and after contact with fish
  - Work from areas of lowest risk to highest risk
  - Limit access to egg or fry facilities

Implementation

- Communication
  - Discuss plan with employees and visitors to the farm
- Written plan
  - Becoming more common requirement
  - Ensures all have access to procedures
- Reassessment
  - What is working, what is not

Additional Resources

- Goodwin A. 2002. Biosecurity protection for fish operations. University of Arkansas Cooperative Extension Service. http://www.aragriculture.org/disaster/biosecurity/protection_fish_operations.pdf.

- Francis-Floyd R. 2003. Sanitation practices for aquaculture facilities. University of Florida, Institute of food and Agricultural Sciences Extension. http://www.aces.edu/dept/fisheries/education/documents/SanitationpracticesforAquacultureFacilities.pdf

- Malison JA, Hartleb CF. 2005. Best management practices for aquaculture in Wisconsin and the Great Lakes Region. http://aqua.wisc.edu/publications/ProductDetails.aspx?productID=485

And Thanks to:

USDA Animal and Plant Health Inspection Service

Fisheries and Illinois Aquaculture Center at Southern Illinois University