Biosecurity in Freshwater Fish Farms and Hatcheries

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Purpose of the Presentation

- **Biosecurity in practical terms for freshwater fisheries**
- **Link biosecurity with routine farm and hatchery management**
- **Practices to prevent disease outbreaks**
- **Implementation challenges**
- **Brief overview of policy and regulatory frameworks**

FAO Definition of Biosecurity

Biosecurity is a **strategic and integrated approach** that encompasses the **policy and regulatory frameworks, risk analysis, and management measures** used to **prevent, minimize, and manage risks** to **human, animal, and plant life and health**, and to **associated risks to the environment**, arising from **pests, diseases, and invasive alien species**.

(FAO, Biosecurity Toolkit / FAO Fisheries & Aquaculture Technical Papers)

Biosecurity is the set of policies and practices implemented to prevent the introduction and spread of diseases and other biological threats in aquaculture systems.

What Does Biosecurity Mean?

- Preventing the introduction, establishment and spread of pathogens
- Applies to farms, hatcheries, nurseries and live fish movement
- Focus on prevention rather than treatment
- A management mindset, not a single activity

BIOSECURITY

CLEAN & DISINFECT

Clean & disinfect nets, tanks, and equipment.

QUARANTINE NEW FISH

Isolate & monitor new fish before introducing.

HEALTH CHECKS

Monitor fish for signs of illness.

DON'T RELEASE INTO THE WILD

Never dump fish or plants into local waterways.

DISPOSE PROPERLY

Dispose of dead fish & waste safely.

KNOW THE RULES

Follow local regulations & guidelines.

STOP THE SPREAD OF DISEASE & INVASIVE SPECIES

Biosecurity is Central to Disease Prevention

- Most diseases enter through seed, water or human activity
- Poor biosecurity amplifies stress and susceptibility
- Early prevention is cheaper than outbreak response
- Reduces dependence on antibiotics and chemicals

Seed / Water / People

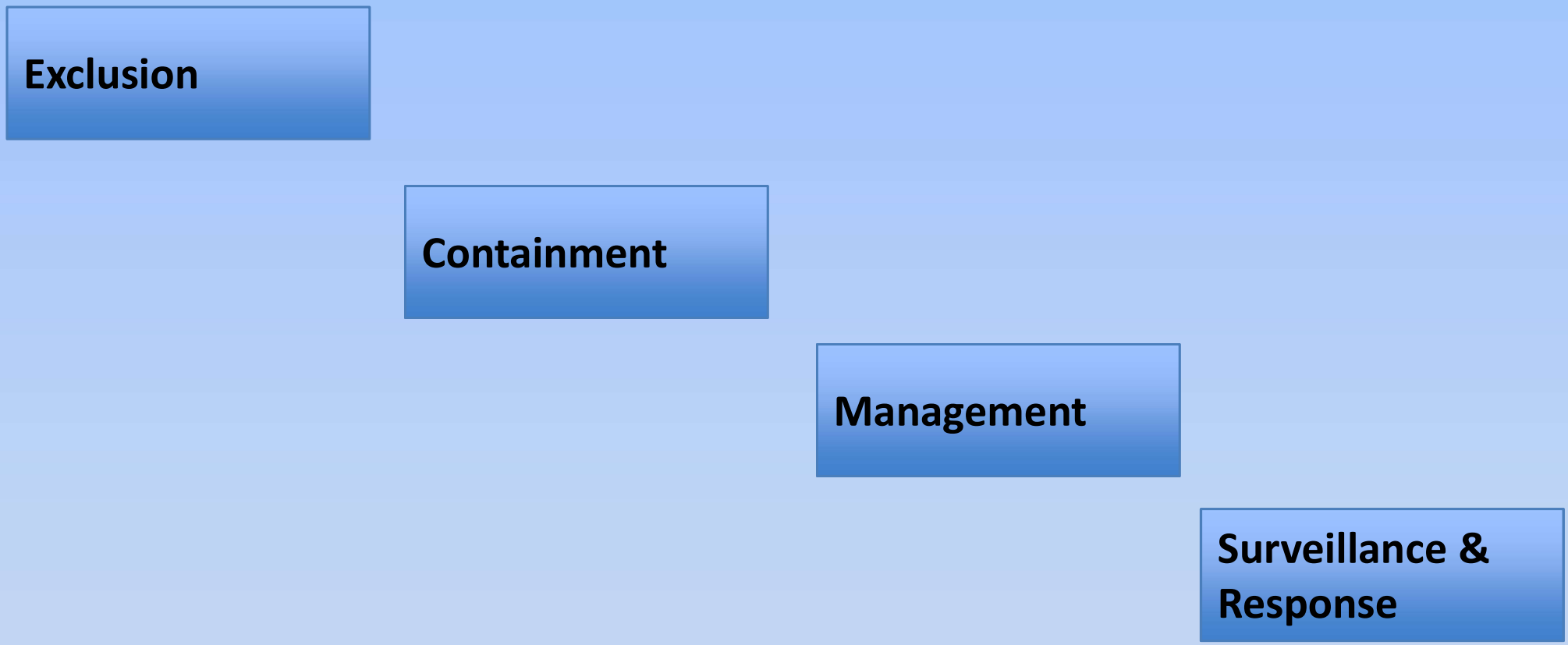
Pathogen Entry

Poor Management

Disease Outbreak

Biosecurity Breaks the Chain

Core Biosecurity Elements



Biosecurity Integrated with Farm Management

- Pond Preparation
- Good Seed
- Water Quality
- Feeding & Density
- Health Monitoring

Biosecurity - a Part of Routine Farm Management

- Pond preparation and water quality management
- Stocking density and feeding practices
- Regular health observation and record keeping
- Hygiene and sanitation of equipment

1. Maintaining Appropriate Biosecurity Prevents Disease Outbreaks

a) Prevents Entry of Pathogens (Exclusion) - infected seed, contaminated water, equipment, or people

- Biosecurity acts as a **first barrier**

b) Reduces Disease Amplification Within the Farm

- High stocking density and poor hygiene - pathogens multiply rapidly
- Biosecurity minimizes **stress, organic load, and pathogen build-up**, reducing disease expression

c) Prevents Spread Between Units and Farms (Containment)

- Once a disease enters, biosecurity limits its movement:
  - Hatchery → nursery → grow-out ponds
  - Pond-to-pond
  - Farm-to-farm
- Critical to **avoid large-scale outbreaks and regional losses**

d) Improves Fish Health and Immunity

- Clean water, good nutrition, and reduced stress enhance **natural resistance**
- Healthy fish are less likely to succumb even when exposed to pathogens

e) Reduces Dependence on Antibiotics and Chemicals

- Fewer disease outbreaks mean:
  - Reduced antibiotic use
  - Lower antimicrobial resistance (AMR) risk
  - Better market acceptance and compliance with regulations

f) Ensures Economic Stability and Sustainability

- Prevents mass mortality
- Reduces production losses and treatment costs
- Enhances long-term farm profitability and bio-secure trade

2. Specific Biosecurity Practices

Biosecurity practices can be grouped into **three levels**:

(i) External biosecurity, **(ii) Internal biosecurity**, and **(iii) Operational management**

A. External Biosecurity (Preventing Disease Entry)

1. Seed and Broodstock Management

- Seed only from **certified disease-free hatcheries**
- Avoid mixing seed from different sources
- Quarantine new broodstock/seed for **7–14 days**
- Screen broodstock for major pathogens

2. Water Source Protection

- Prefer borewell or reservoir water over untreated surface water
- Install **inlet filtration screens**
- Use settling tanks or reservoirs
- Disinfect water

3. Control of Visitors and Vehicles

- Restrict unnecessary entry into hatcheries and farms
- Maintain **visitor entry records**
- Provide footbaths with disinfectants at entry points
- Disinfect vehicles, nets, and crates entering the farm

4. Control of Wild Animals and Vectors

- Prevent entry of wild fish, frogs, birds, and crabs using:
  - Pond fencing
  - Bird netting
  - Fine inlet/outlet screens

B. Internal Biosecurity (Preventing Disease Spread Within the Farm)

5. Pond and Unit Segregation

- Treat each pond/tank as a **separate biosecurity unit**
- Avoid sharing water, nets, or equipment between ponds
- Design separate inlet and outlet channels

6. Equipment and Tool Hygiene

- Use **pond-specific nets, buckets, and feeding trays**
- Clean and disinfect equipment after each use
- Sun-dry nets and tanks to kill pathogens

7. Personnel Movement Protocols

- Follow movement **healthy → suspect → diseased units**
- Use dedicated footwear and gloves
- Wash hands with disinfectant before and after handling fish

8. Dead Fish and Waste Management

- Remove dead or sick fish immediately
- Dispose by deep burial with lime etc
- Never throw dead fish into nearby water bodies

C. Hatchery-Specific Biosecurity Practices

9. Egg and Larval Biosecurity

- Disinfect eggs before incubation
- Use UV-treated or filtered water in incubation units
- Maintain optimal temperature and dissolved oxygen

10. Tank and Facility Sanitation

- Clean and disinfect tanks between batches
- Maintain proper drainage and waste disposal
- Regularly clean aeration systems and pipelines

11. Live Feed Biosecurity

- Use treated or cultured live feed
- Disinfection of wild-collected live feed

D. Operational and Health Management Measures

12. Water Quality Management

- Regular monitoring of:
  - Dissolved oxygen
  - pH
  - Ammonia and nitrite
- Poor water quality - ↓ fish immunity - triggers disease

13. Feed and Nutrition Management

- Use good-quality, fresh feed
- Avoid overfeeding
- Store feed in dry, pest-free conditions

14. Health Monitoring and Record Keeping

- Daily observation of fish behavior and feeding
- Maintain records of:
  - Mortality
  - Treatments
  - Water quality
  - Stocking and harvest

15. Emergency Disease Response Plan

- Isolate affected ponds immediately
- Stop movement of fish and equipment
- Consult aquatic animal health professionals
- Report unusual mortality events promptly

3. Key Message for Farmers and Hatchery Operators

Biosecurity is cheaper than treatment.

Disease prevention through biosecurity is more effective, economical, and sustainable than curing outbreaks after they occur.

Key Elements of Effective Biosecurity

- Exclusion – keeping pathogens out
- Containment – limiting spread within the farm
- Management – reducing stress and exposure
- Surveillance – early detection and response
- Reporting systems

Health Monitoring and Farm Hygiene

- Daily observation of fish behavior and feeding
- Prompt removal of sick and dead fish
- Cleaning and drying of nets and gear
- Basic record keeping of mortalities and treatments

Hatchery Biosecurity – Why It Is Critical

- Hatcheries act as disease multipliers
- Vertical and horizontal disease transmission risks
- One infected batch can affect multiple farms

Key Hatchery Biosecurity Practices

- Broodstock health screening and separation
- Egg disinfection and hygiene
- Treated water for incubation and rearing
- Separation of age groups and clean workflows

Seed Quality and Disease Prevention

- Importance of disease-free seed
- Quarantine and observation before distribution
- Traceability of broodstock and seed batches
- **Avoiding informal and unregulated seed sources**

Link Between Biosecurity and AMR

- Better biosecurity reduces disease pressure
- Lower disease means reduced antibiotic use
- Prevents emergence and spread of resistance
- Supports One Health objectives

Common Practical Challenges

- Small farm sizes and open systems
- Limited awareness and training
- Cost constraints
- Shared water sources

Challenges Specific to Hatcheries

- High stocking densities
- Continuous production cycles
- Pressure to meet seed demand
- Limited access to diagnostics

Behavioral and Systemic Constraints

- Reliance on treatment rather than prevention
- Informal seed and input markets
- Weak enforcement of standards
- Low risk perception during non-outbreak periods

Indian Biosecurity Policy Landscape

- Biosecurity addressed indirectly through multiple frameworks
- Focus on productivity with increasing attention to health
- Biosecurity still evolving as a formal concept

Key Indian Initiatives

- ICAR advisories and health management guidelines
- NASPAAD, Fish Health & Vaccines Network Projects, Accreditation of hatcheries
- NFDB and PMMSY health and seed quality components
- National Action Plan on AMR (One Health)

1. National Fisheries Policy (Draft) – Health & Biosecurity

•The **National Fisheries Policy, 2020 (draft)** - *maintaining aquatic animal health and biosecurity* - sustainable fisheries and aquaculture development.
•It outlines:

- **Disease surveillance, early warning systems, risk assessment**, and contingency planning.
- Strengthening capacity of institutions for **quarantine, diagnostics, and laboratory networks**.
- Promotion of **best practices for aquatic animal health management** and stakeholder capacity building.

Although this draft has not been fully formalized into law yet, it reflects the government's intention to integrate biosecurity into long-term fisheries strategy.

Existing Legislation & Guidelines Affecting Biosecurity

Prevention and Control of Infectious and Contagious Diseases of Animals Act, 2009

•Provides **legal basis for controlling animal diseases** including aquatic species. It covers disease reporting and control measures which are relevant to fish health and outbreak containment.

Livestock Importation Act, 1898

•Governs importation of live animals and containment of diseases; applicable to the import of fish species and broodstock, thus influencing biosecurity related to transboundary disease risks.

(State-level) SOPs and Aquatic Health Management Manuals

- Some states (e.g., Kerala) have developed **SOPs for aquatic disease diagnosis and management**, which function as local biosecurity guidance for farmers and fisheries officers.

Related Biosecurity Efforts & Emerging Frameworks

Traceability & Quality Assurance

•The GOI proposed to establish a **national digital traceability system for fisheries and aquaculture** to improve transparency and align with global standards a step that supports biosecurity and quality control

Vaccination & Disease Control Protocols

•India is progressing toward **species-specific aquaculture vaccines**, which—once guided by formal regulatory standards will enhance preventive biosecurity in freshwater systems.

Regulatory Gaps in India

- Single comprehensive freshwater biosecurity law
- Weak seed certification enforcement
- Limited surveillance and reporting
- Inconsistent state-level implementation

International Best Practices

- Risk-based biosecurity planning
- Mandatory reporting of diseases
- Strong hatchery certification systems
- Farmer accountability and traceability
- **International standards (WOAH Aquatic Animal Health Code)** provide a strong template for comprehensive biosecurity (quarantine, surveillance, reporting, emergency response).

What Can Be Realistically Adopted in India?

- Simple, low-cost biosecurity measures
- Focus on hatcheries as control points
- Cluster-based disease management
- Capacity building and incentives

Role of Extension and Capacity Building

- Farmer and hatchery operator training
- Practical SOPs and checklists
- Demonstration farms and pilots
- Linking biosecurity to profitability

Unlike coastal aquaculture (regulated under the *Coastal Aquaculture Authority Act* for shrimp, brackishwater etc.), **freshwater fish biosecurity per se is not comprehensively codified at the state level** in terms of disease reporting, mandatory biosecurity practices, quarantine, stocking densities or water quality limits. States still lack explicit disease-specific enforceable freshwater biosecurity rules

Key Management Practices – Summary

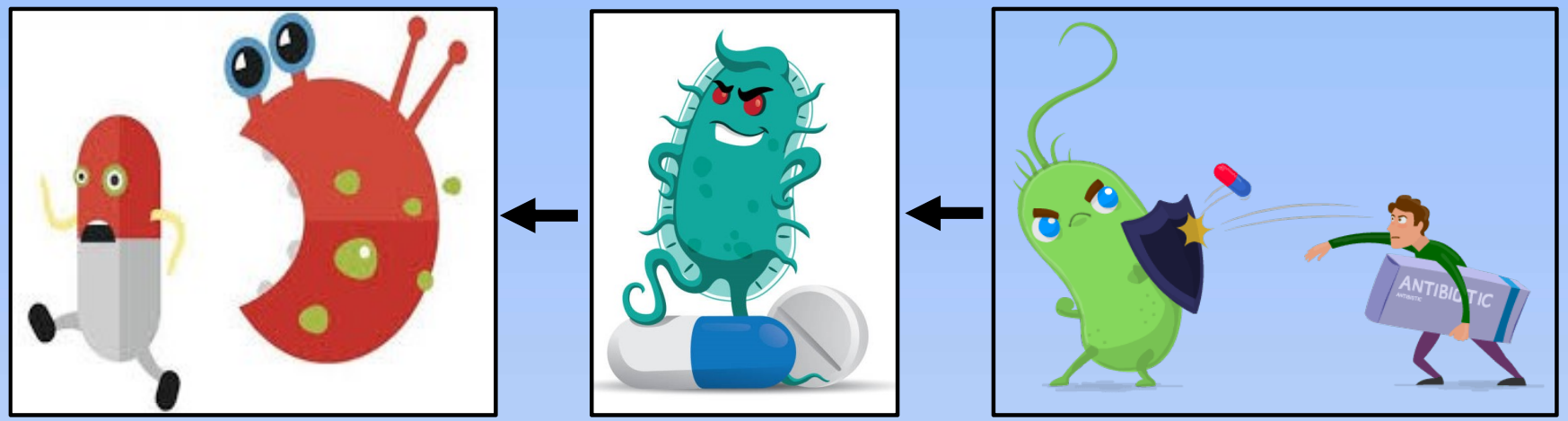
- Good seed, good water, good hygiene
- Stress reduction through management
- Early detection and rapid response
- Prevention over treatment

Take-Home Messages

- Biosecurity is practical farm management
- Disease prevention starts at hatchery level
- Small steps make big differences
- Sustained adoption needs support systems

Level	Responsibility
Farm / Hatcharies	Reporting, containment, compliance
State Fisheries Dept.	Sample collection, advisories, movement control
NSPAAD/GOI/ ICAR	Diagnostics, surveillance data
National Authority	WOAH reporting, risk communication

WHO IS STRONGER?



ANTIBIOTICS: HANDLE WITH CARE

Not all bugs need drugs

Biosecurity in aquaculture: prevention is protection

Thank You All