BIOSECURITY FOR AQUACULTURE OPERATIONS

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MARKETING AND PROCESSING WORKSHOP
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OUTLINE

- What is biosecurity?
- How do I develop a biosecurity plan?
- Summary

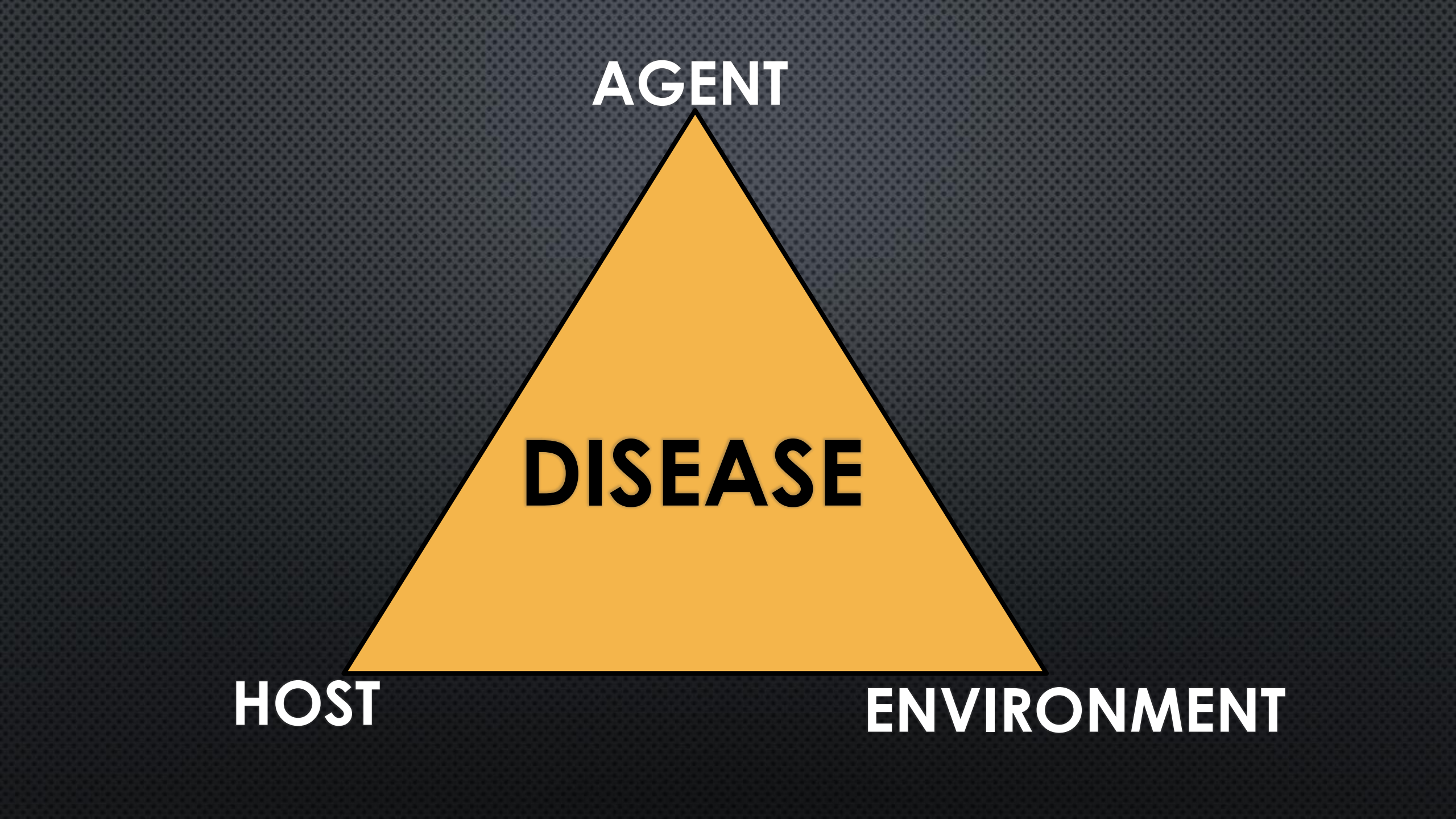
GOALS

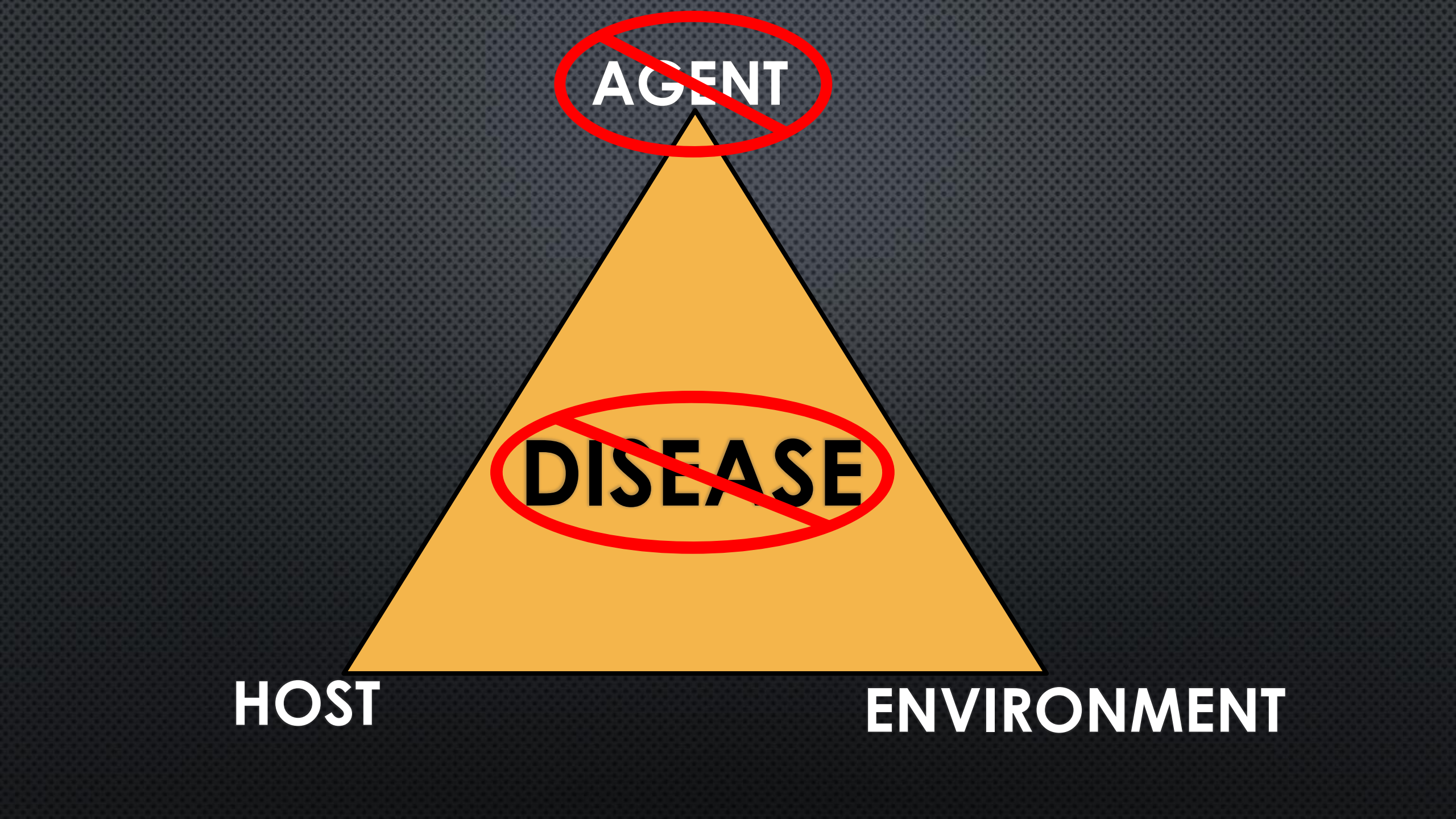
- Gain a better understanding of biosecurity
- Critically assess your farm
- Begin to think about your biosecurity plan

WHAT IS BIOSECURITY?

- Practices that **minimize the risk** of:
  - Introducing an infectious agent into the facility
    - Bacterial, viral, parasitic, fungal
  - Spreading the agent to other fish on the farm
  - Allowing the agent to leave the farm

- Comprehensive approach
  - Encompasses different means of prevention and containment


AGENT
DISEASE
HOST
ENVIRONMENT


AGENT
DISEASE
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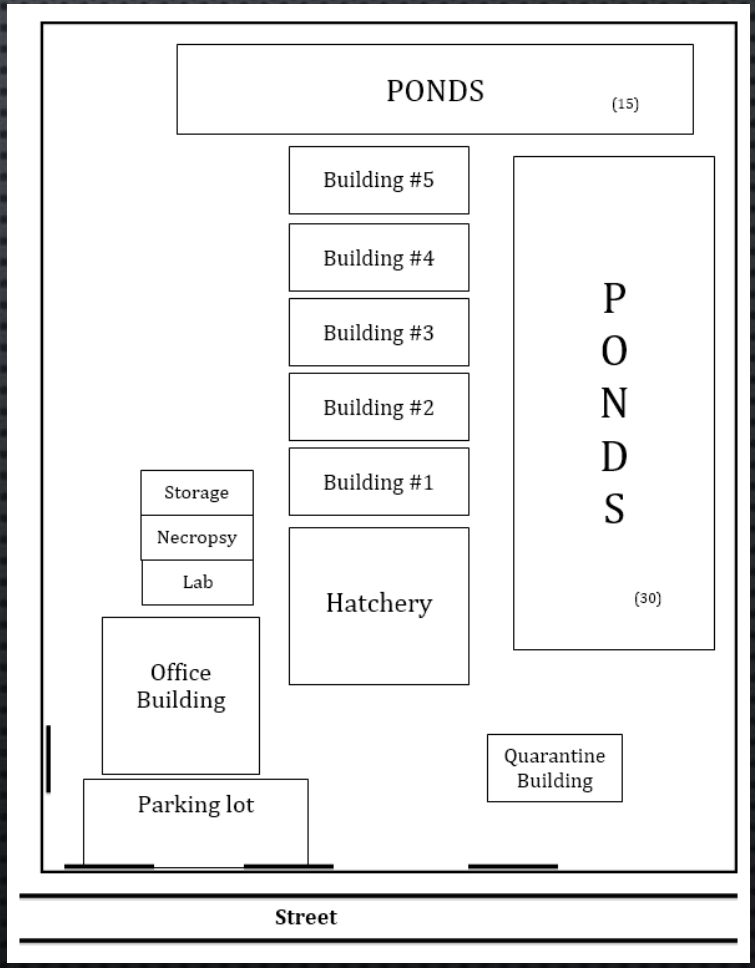
DEVELOPING A BIOSECURITY PLAN

THINGS TO REMEMBER BEFORE WE START:

- DON'T REINVENT THE WHEEL – MANY GOOD RESOURCES AVAILABLE
- HOWEVER, EACH FARM IS DIFFERENT
- ECONOMICS MUST BE CONSIDERED – UNLESS THIS IS A HOBBY
- PRACTICALITY IS VITAL
  - NO IMPLEMENTATION = WASTE OF TIME MAKING A PLAN
- YOU **MUST** HAVE A WRITTEN PLAN
  - IF IT'S NOT WRITTEN IT WON'T GET FOLLOWED
  - WRITING OUT A PLAN FORCES YOU TO CONSIDER THINGS YOU MIGHT OTHERWISE NOT CONSIDER

First Step: What do you have now?

- Schematic of your farm
  - Overview of entire farm
  - Schematics for each building
- Are your ponds/tanks/cages numbered?
  - If I walked on your farm, will I know what is what?



First Step: What do you have now?

- Water Source
  - Deep wells safest
  - Surface water – increased risk
  - Reservoir with fish and birds – riskiest
- Define a "unit"
  - Pond
  - Tank or group of tanks
  - One complete recirculating system
  - Building

Second Step: Complete a Risk Analysis

1) Hazard Identification

   what agents should you be worried about?

2) Risk Assessment

   how likely are those agents?

   What are the consequences?

   Possible routes of entry

3) Risk Management

   what can I do to mitigate the risks?

Second Step: Complete a Risk Analysis

Hazard Identification

What pathogens affect the animals on your farm?

- Any disease problems previously encountered
- Common pathogens for the species you raise
- Different life stages present on the farm
  - Eggs, fry, juvenile, adult, broodfish
- Housing methods used
  - Ponds, raceways, tanks
  - Flow through vs recirculating
- Common problems others encounter

Second Step: Complete a Risk Analysis

Risk Assessment – How likely?

Host factors

- Species, life stage, level of stress

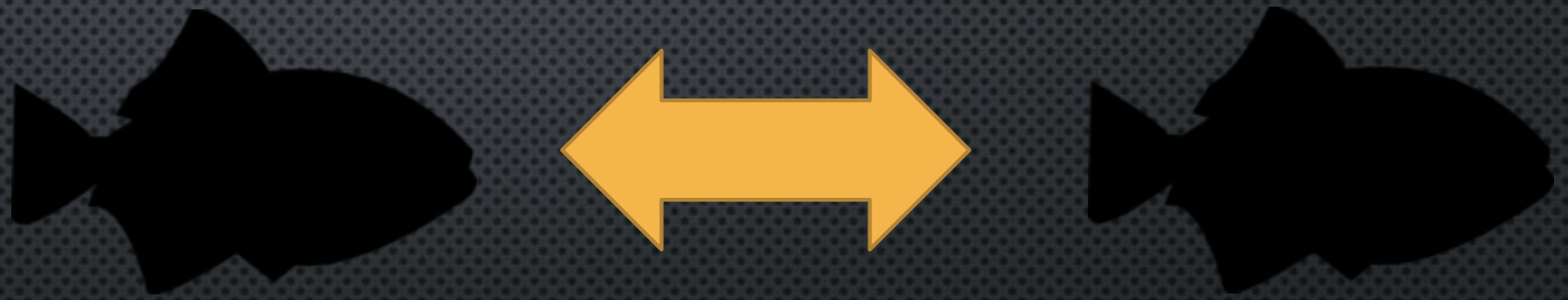
Agent factors

- Mode of transmission
  - Vertical
  - horizontal
- Lifecycle
- Persistence in the environment
- Ability to create a carrier/latent stage

Environmental factors

VERTICAL TRANSMISSION

HORIZONTAL TRANSMISSION



Definitive Host

eggs

miracidia

First Intermediate Host

D. spathans

cercariae

B. damnificus

Second Intermediate Host

metacercariae

Courtesy of Dr. Lester Khoo

SECOND STEP: COMPLETE A RISK ANALYSIS

RISK ASSESSMENT – CONSEQUENCES?

- MEAN MORTALITY FROM DISEASE
- LOSS OF PRODUCTION
- TREATMENT OR CULLING COSTS
- MOVEMENT RESTRICTIONS
- LOSS OF CUSTOMERS
- PRODUCT QUALITY
- ZOONOTIC POTENTIAL

SECOND STEP: COMPLETE A RISK ANALYSIS

RISK ASSESSMENT – CONSEQUENCES?

- TREATMENT COSTS
  - DIAGNOSTIC CHARGES
  - THERAPEUTANTS
  - LABOR
  - WITHDRAWAL TIMES
- CULLING COSTS
  - LABOR
  - DISPOSAL
- ZOONOTIC POTENTIAL

SECOND STEP: COMPLETE A RISK ANALYSIS

- RISK ASSESSMENT – CONSEQUENCES?
  - MOVEMENT RESTRICTIONS
    - INABILITY TO SHIP SICK FISH
  - LOSS OF CUSTOMERS
    - REPUTATION IS KEY WHEN SUPPLYING FISH
  - PRODUCT QUALITY

Second Step: Complete a Risk Analysis

Categorize each agent on your list

Likelihood of agent

Low

Moderate

High

Consequence if present

Minor

Moderate

Major

	CONSEQUENCE		
LIKELIHOOD	MINOR	MODERATE	MAJOR
LOW	LOW RISK	LOW RISK	MODERATE RISK
MODERATE	LOW RISK	MODERATE RISK	HIGH RISK
HIGH	MODERATE RISK	HIGH RISK	HIGH RISK

RISK ASSESSMENT – POSSIBLE ROUTES OF ENTRY

RISK ASSESSMENT – ROUTES OF ENTRY?

- WATER SOURCE
  - GROUND WATER – SAFEST
  - SURFACE WATER – INCREASED RISK
  - NATURAL WATERWAY (CAGE CULTURE) – VERY RISKY
- NEW FISH ARRIVALS
  - WATER IN TRANSPORT
  - SHIPPING MATERIALS

SECOND STEP: COMPLETE A RISK ANALYSIS

- RISK ASSESSMENT – ROUTES OF ENTRY?
  - PEOPLE
    - EMPLOYEES
    - FAMILY/VISITORS
    - DELIVERY
  - BOOTS
  - CLOTHES

SECOND STEP: COMPLETE A RISK ANALYSIS

RISK ASSESSMENT – ROUTES OF ENTRY?

- EQUIPMENT
  - VEHICLES
    - EMPLOYEE, VISITOR, FEED DELIVERY, ETC.
  - NETS
  - SEINES
  - DISSOLVED OXYGEN METERS

SECOND STEP: COMPLETE A RISK ANALYSIS

RISK ASSESSMENT – ROUTES OF ENTRY?

- OTHER ANIMALS
  - BIRDS
  - PREDATORS
  - TURTLES
  - SNAKES
- FEED
  - LIVE
  - FROZEN
  - COMMERCIAL

SECOND STEP: COMPLETE A RISK ANALYSIS

RISK MANAGEMENT

WHERE DO YOU GET YOUR FISH?

- FISH CAN LOOK HEALTHY BUT STILL CARRY PATHOGENS

TRUSTED SUPPLIER

- TALK TO OTHERS RAISING THE SAME SPECIES
  - WHERE DO THEY BUY FISH?
  - DO THEY HAVE ANY DISEASE PROBLEMS?

HEALTH INSPECTIONS

- HELP SIGNIFICANTLY DECREASE RISK FOR THE PATHOGENS ASSESSED
- NOT A GUARANTEE
- ONLY SPECIFIC PATHOGENS

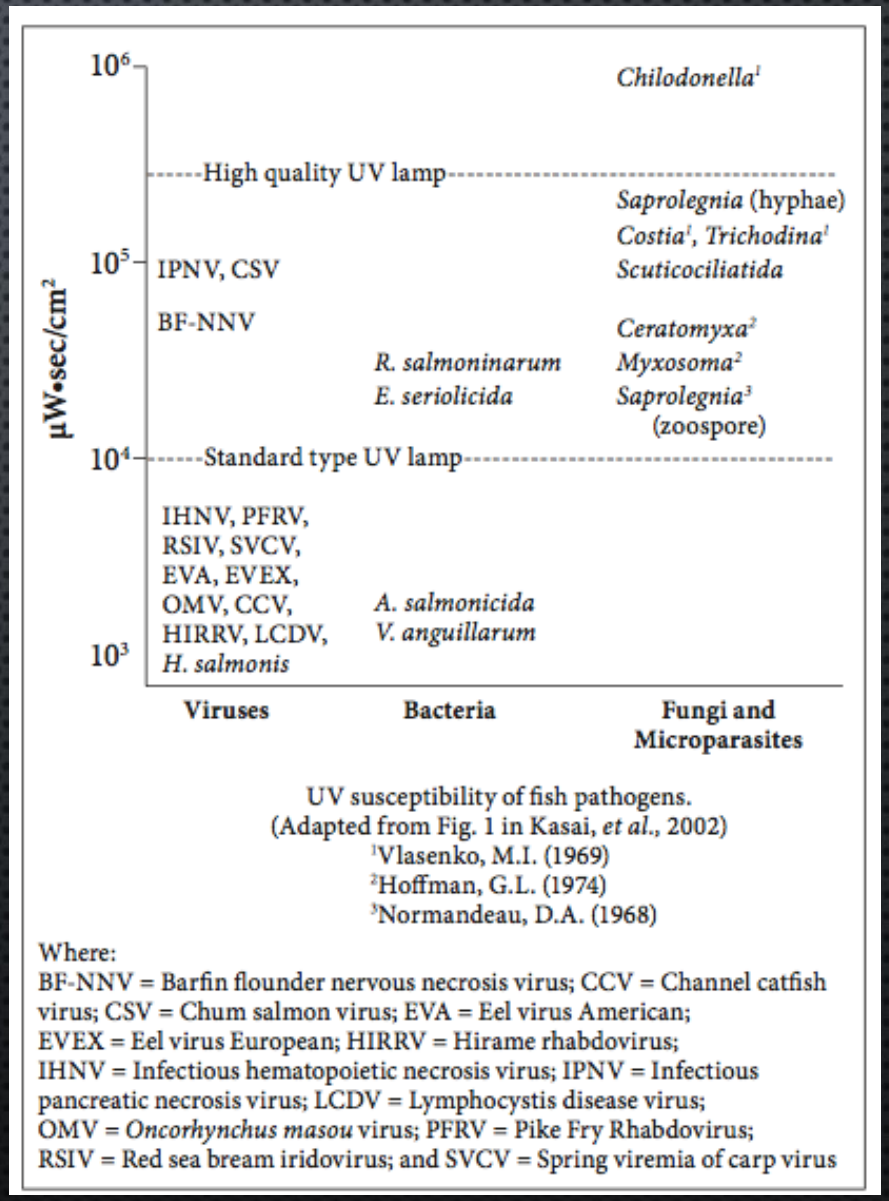
SECOND STEP: COMPLETE A RISK ANALYSIS

RISK MANAGEMENT

- WHERE DO NEW ARRIVALS GO?
  - **QUARANTINE**
    - IDEALLY SEPARATE BUILDING
    - MUST BE SEPARATE UNIT
      - DEDICATED EQUIPMENT
      - PHYSICAL SEPARATION TO PREVENT SPLASHING
    - TYPICALLY A MINIMUM OF 3 WEEKS
      - PATHOGENS OF CONCERN
      - WATER TEMPERATURE
      - STRESS?

SECOND STEP: COMPLETE A RISK ANALYSIS

- RISK MANAGEMENT
  - HOW DO YOU RAISE YOUR FISH?
    - PONDS
    - RACEWAYS
    - CAGES
    - INDOOR TANKS
  - WATER TREATMENTS
    - DEGASSING TOWERS
    - OZONE
    - ULTRAVIOLET LIGHT



UV susceptibility of fish pathogens.
(Adapted from Fig. 1 in Kasai, *et al.*, 2002)
[1]Vlasenko, M.I. (1969)
[2]Hoffman, G.L. (1974)
[3]Normandeau, D.A. (1968)

Where:
BF-NNV = Barfin flounder nervous necrosis virus; CCV = Channel catfish virus; CSV = Chum salmon virus; EVA = Eel virus American; EVEX = Eel virus European; HIRRV = Hirame rhabdovirus; IHNV = Infectious hematopoietic necrosis virus; IPNV = Infectious pancreatic necrosis virus; LCDV = Lymphocystis disease virus; OMV = *Oncorhynchus masou* virus; PFRV = Pike Fry Rhabdovirus; RSIV = Red sea bream iridovirus; and SVCV = Spring viremia of carp virus

SRAC Publication #4707

SECOND STEP: COMPLETE A RISK ANALYSIS

- RISK MANAGEMENT
  - PEOPLE
    - HANDWASHING STATIONS
    - ORDER OF DAILY OPERATIONS
      - MOST SUSCEPTIBLE FIRST
      - LEAST SUSCEPTIBLE LAST
    - TIME OF DAY
      - HANDLE FISH IN THE EARLY MORNING OR LATE EVENING

SECOND STEP: COMPLETE A RISK ANALYSIS

- RISK MANAGEMENT
  - PEOPLE
    - FOOT BATHS?
      - KEEPS SHOES AND FLOOR CLEAN
      - CAN PREVENT PATHOGEN ENTRY INTO BUILDING
      - VISUAL REMINDER OF BIOSECURITY
    - CHALLENGES
      - MUST BE MAINTAINED
      - CHECK EFFECTIVENESS OF DISINFECTANT
      - TREAT FLOOR AS DIRTY ANYWAY?

1. *dirty boots*

2. *rinsed with water*

3. *disinfected*

Source: ILVO

ILVO

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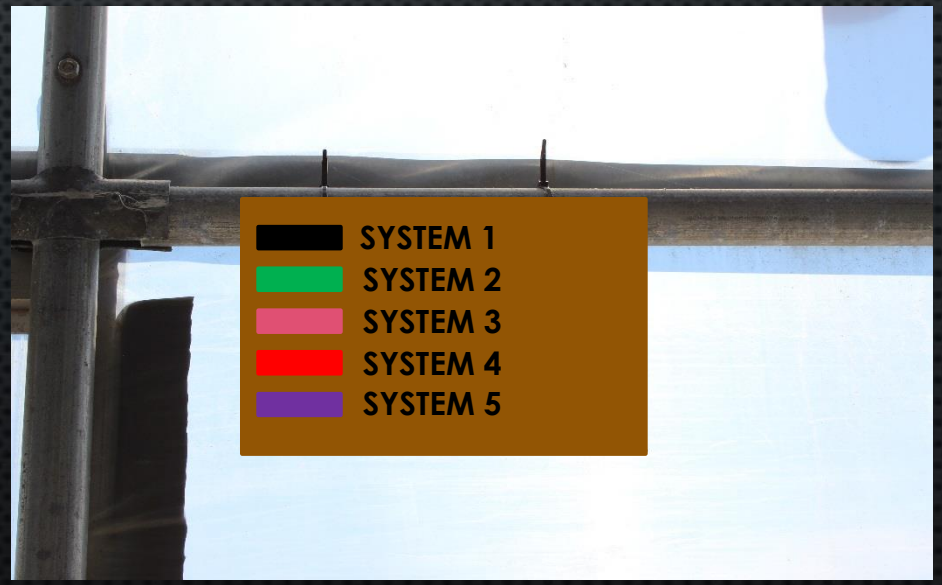
SECOND STEP: COMPLETE A RISK ANALYSIS

- EQUIPMENT
  - DEDICATED EQUIPMENT FOR EACH "UNIT"
    - IF NOT POSSIBLE, PROPER CONTACT TIME FOR DISINFECTION
  - CLEANED AFTER EACH USE
    - APPROPRIATE DISINFECTANT
  - SEPARATE SET OF EQUIPMENT FOR NEW FISH ARRIVALS



SECOND STEP: COMPLETE A RISK ANALYSIS

- WHAT DO YOU FEED YOUR FISH?
  - LIVE FEED
    - HIGHEST RISK OF PATHOGEN ENTRY
  - FROZEN FEED
    - MODERATE RISK OF PATHOGEN ENTRY
  - COMMERCIAL FEED
    - LOW RISK OF PATHOGEN ENTRY FOR EXTRUDED FEED
- PROPER STORAGE
  - COOL, DRY AREA
  - SEALED CONTAINER IS BEST
- APPROPRIATE AMOUNT
  - TOO MUCH CAN DECREASE WATER QUALITY

WHICH MITIGATION STEPS ARE ECONOMICAL?

REVIEW YOUR LIST OF POSSIBLE MITIGATION STEPS FOR IDENTIFIED RISKS

HOW MUCH WILL EACH COST?

- DIRECT COSTS – DISINFECTANTS, FOOT BATHS, EXTRA EQUIPMENT, ETC.
- INDIRECT COSTS – LABOR, WEAR ON EQUIPMENT, ETC.

COSTS VS BENEFITS

WHICH MITIGATION STEPS WILL YOU IMPLEMENT?

COMMUNICATION OF PLAN

- SIGNAGE THROUGHOUT FARM
  - KEEP UPDATED
  - REPLACE WHEN HARD TO READ
  - DO NOT OVERUSE
- INCLUDE EMPLOYEES (AND FAMILY) IN PLAN DEVELOPMENT
  - INCREASES BUY-IN
  - RAISES AWARENESS OF THE IMPORTANCE OF BIOSECURITY

COMMUNICATION OF PLAN

EMPLOYEE TRAINING

- DO YOUR EMPLOYEES KNOW WHAT THEY SHOULD DO?
  - WRITTEN PROTOCOLS
  - NEW EMPLOYEE TRAINING
  - PERIODIC TRAINING
- ARE THEY PROVIDED WHAT THEY NEED TO DO IT?
  - EQUIPMENT IN GOOD WORKING ORDER
  - TIME TO DO THINGS CORRECTLY
- ARE THEY DOING IT?
  - IS THERE ACCOUNTABILITY FOR EVERYONE? INCLUDING YOURSELF?
  - CHECKLISTS FOR OPERATIONAL TASKS – INITIALED WHEN COMPLETE

SUMMARY

YOU NEED A WRITTEN BIOSECURITY PLAN

EACH FARM IS DIFFERENT

PRACTICALITY IS KEY

WHAT DO YOU HAVE NOW?

RISK ANALYSIS

ECONOMIC CONSIDERATIONS

SELECT MEASURES TO IMPLEMENT

COMMUNICATION AND IMPLEMENTATION OF PLAN

QUESTIONS?

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