

Biosecurity Auditing in Recirculating Aquaculture Systems



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Biosecurity: More Than Footbaths and Disinfection

- Prevention, Reduction or Elimination of all causes of production losses
- Part of other facility-level approaches: fish health programs, infrastructure design and integrity, Quality Control programs, operational manuals, HACCP plans, BMP or other certifications

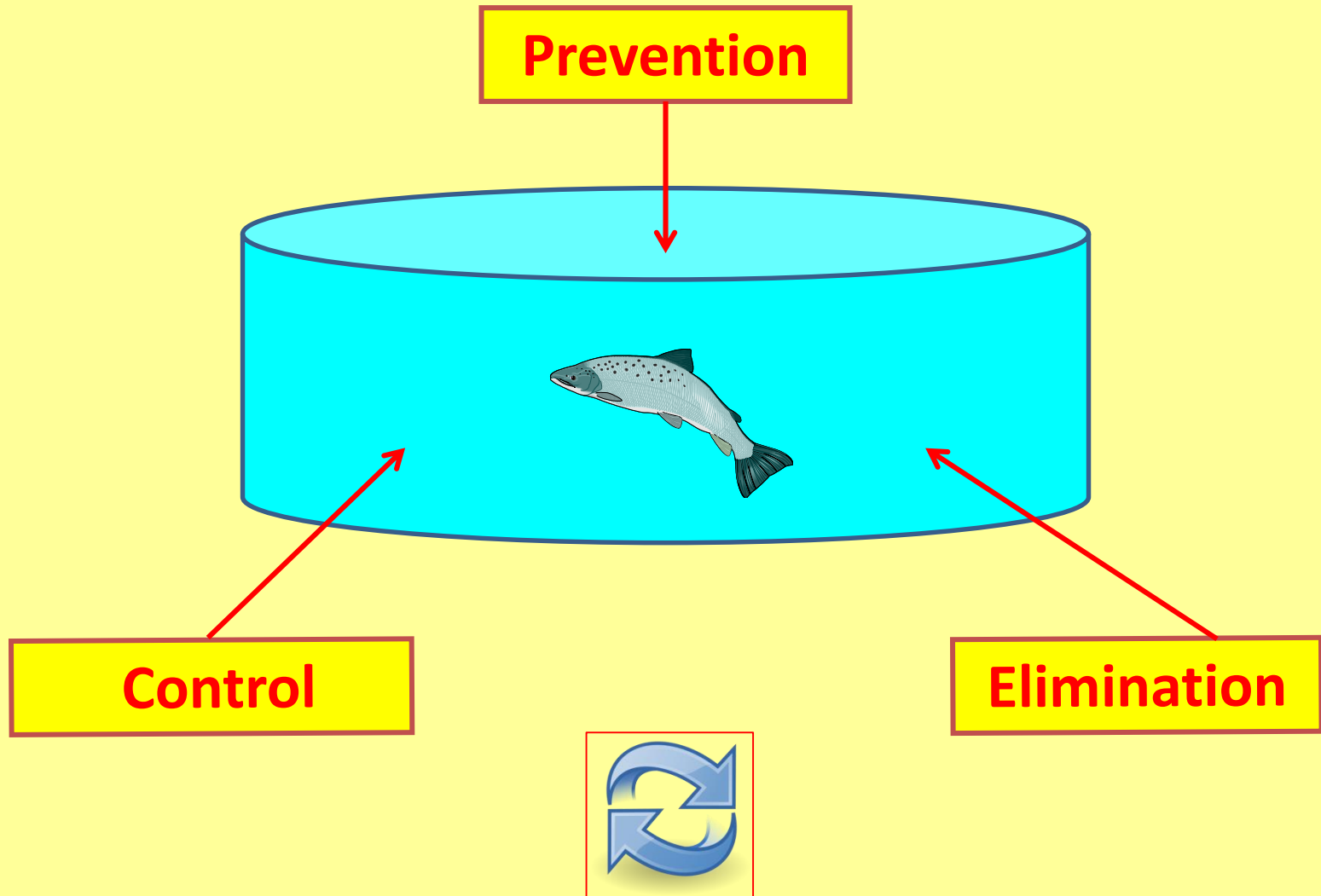


Biosecurity: More Than Footbaths and Disinfection

- ‘Weakest Link’: useful concept but difficult to identify and correct/change before problems occur
- Routine and trending data analyses useful
- Biosecurity is inherently compatible with Risk-Based Thinking

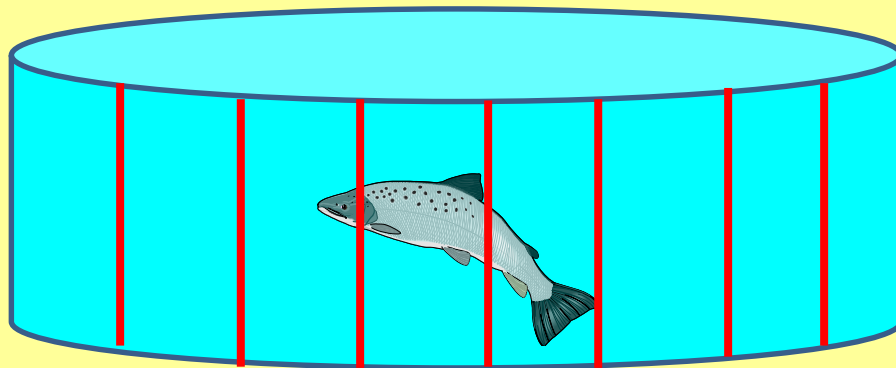


Basic Biosecurity Approaches



Biosecurity Objectives

- Establish barriers to prevent or decrease loss- risk factors
- Reduce frequency, duration & intensity of exposure to all agents of concern
- Establish surveillance/monitoring to characterize and measure disease parameters

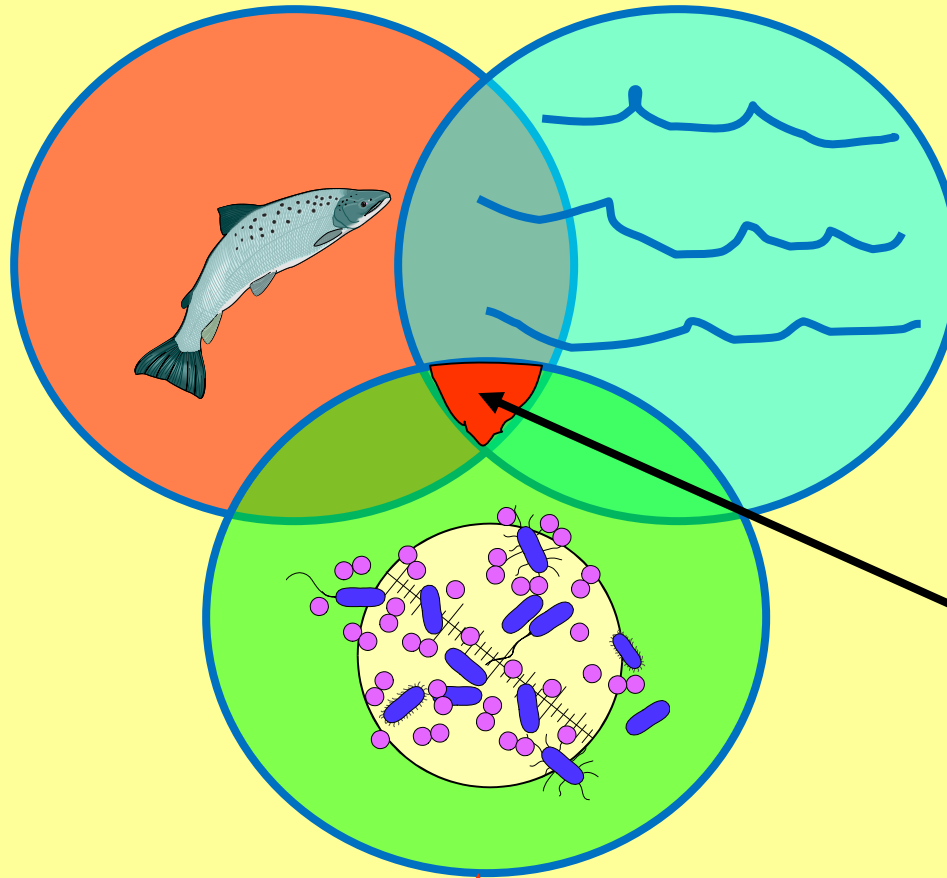


General Health Triad

After Sniezko *et al*

Susceptible
Populations

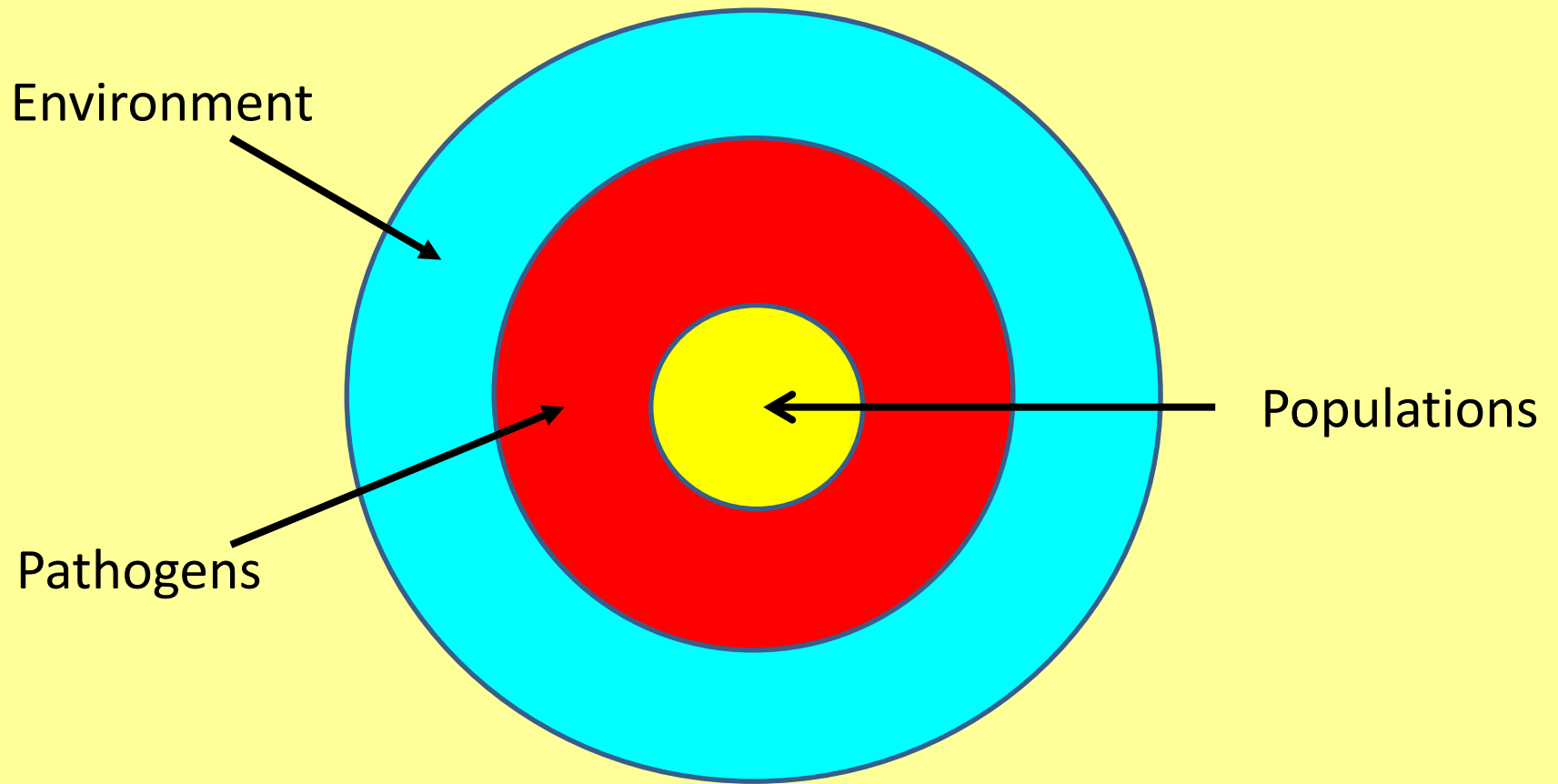
Facilitative
Environment



"Disease"

Virulent Pathogens

Health Continuum (RAS)



Risk Comparisons

Flow-through/Open Systems

- Predators
- Parasites
- Other pathogen exposures
- Pollution/toxins
- Escapes
- Wild fish interactions
- Less-controlled environmental factors (temp, flow, DO)
- Nutrients

RAS

- People
- Systems capacities and monitoring
- Systems backups
- Nitrogen metabolism
- Gas pressures
- Biofilter/biofilm influences and changes
- Ability to contain/isolate
- Treatment effects
- Reaction time



Risk-Based Thinking

- Derives from principles used in epidemiology and disease management
- Uses active and passive observational information sources
- Incorporates various statistical indices for confidence in data and conclusions (true/false positives and negatives)
- Do not necessarily reflect the Precautionary Principle
- Can help determine odds/probabilities for various outcomes



Risk-Based Thinking

- Can identify factors that can cause deviations from expected results
- Helps define the necessary organizational/leadership and production contexts for optimal outcomes
- Helps determine what can be controlled, influenced, or neither
- Plan, act, assess, adjust

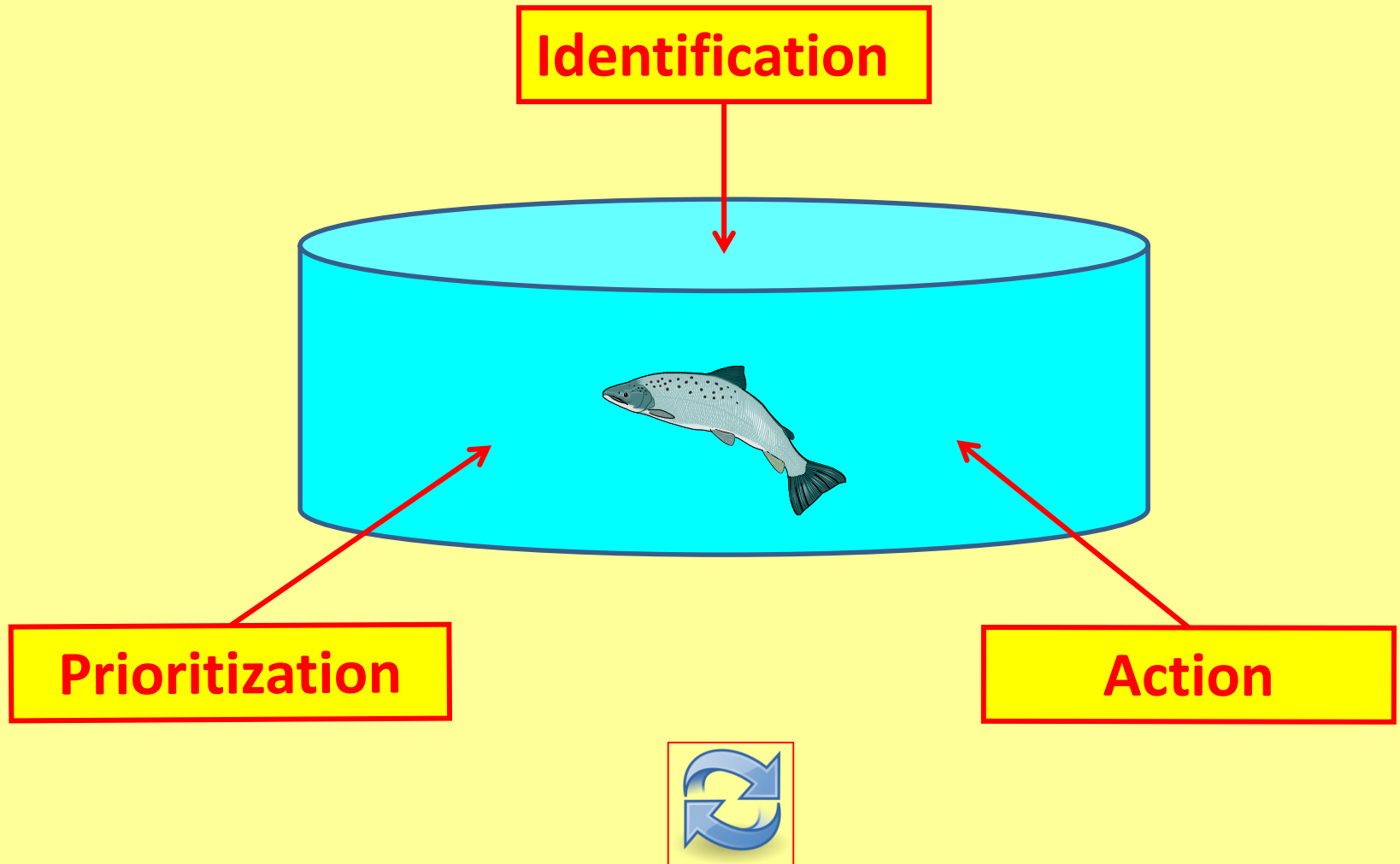


Risk-Based Thinking

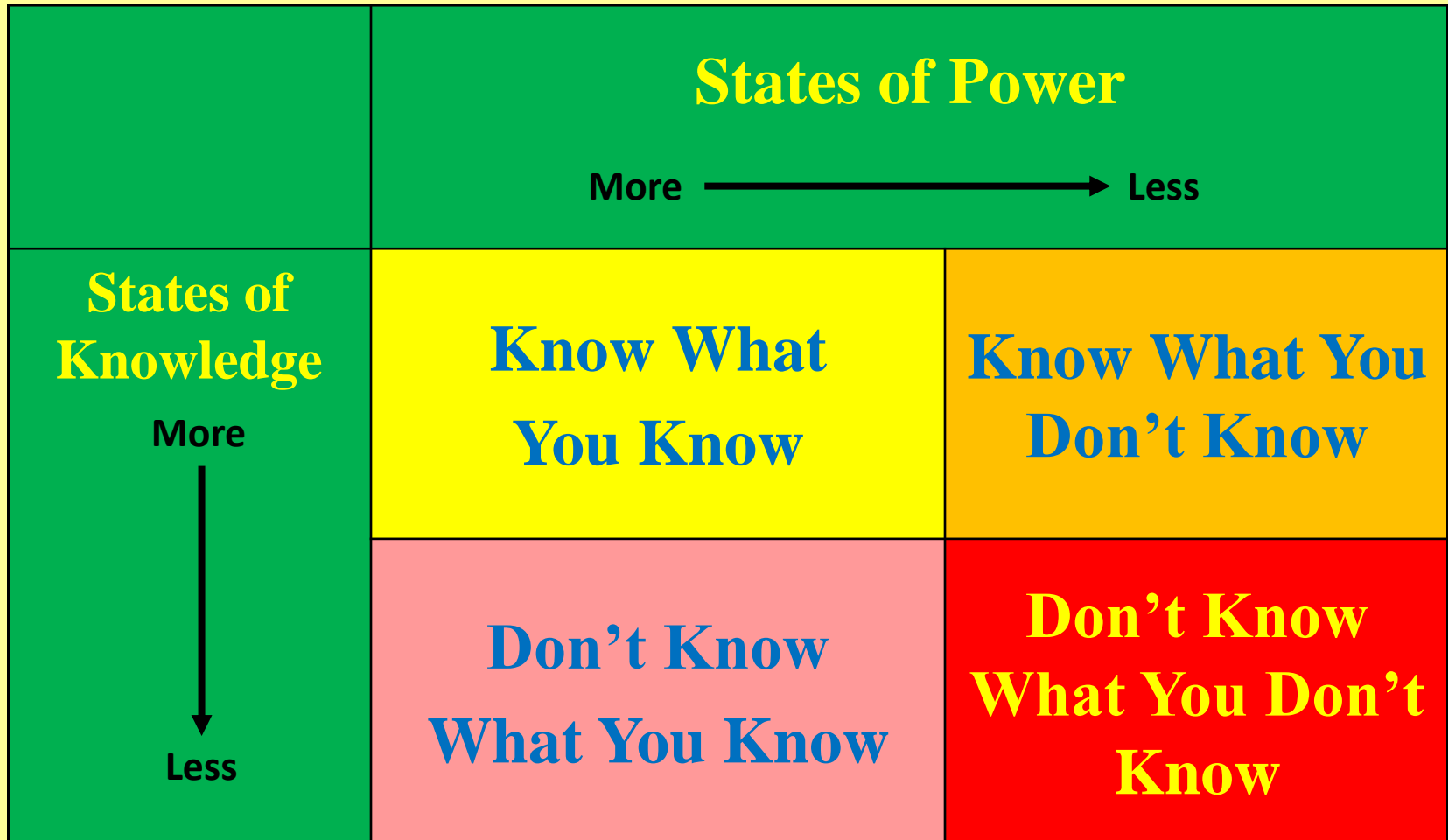
- RAS risk determinations and assessments require challenging the known/assumed factors for flow-through aquaculture
- Controllable vs. uncontrollable actions and reactions
- Unrelated vs. ripple/cascade risk relationships
- Single vs. multiple vs. continuous vs cumulative effects of exposures
- Spectrum of SEIDM risks: 0 to 100%



Risk Management Approaches



Knowledge is Power



Biosecurity/Risk Auditing

- A comprehensive review and assessment of all potential loss risk factors
- Should be periodic but regular
- Updates as needed
- Internal (dedicated staff) vs. External/3rd party, or both



Biosecurity/Risk Auditing

- Risk identification
- Risk communication
- Risk planning/management
(prevention/reduction/elimination)
- Documentation
- Review/feedback/adjustments



Biosecurity/Risk Auditing

- Detailed questionnaire sent in advance
- Site review
- 18 risk categories included



Some B/R audit assessment categories: Fish Health Assessments

- *Health goals*: what, who, how, when, where
- *Monitoring* approach/frequency; statistical indices (prevalence assumptions)
- *Problem recognition* criteria and action thresholds
- Surveillance vs. Certifications vs. Diagnostics
- Periodic surveys of biofilters, drains, gut biomes, etc.
- In-house lab/testing capacities
- Trends and patterns: analyses and interpretations



Some B/R audit assessment categories: Markets/Financial

- Market-related: actual vs. potential markets; dependence on specialty (uniqueness); certifications; organics; value-added options; antibiotic-free philosophy; branding approach; claim verifications; GMO components; social media; other outreach (community/media); overall transparency
- Financial continuity



Reports

- All inputs reviewed after visit
- Loss risk categories merged with specific biosecurity options to develop/implement or refine
- Semi-quantitative risk scoring provided
- Final report generated for review/discussion
- Costs

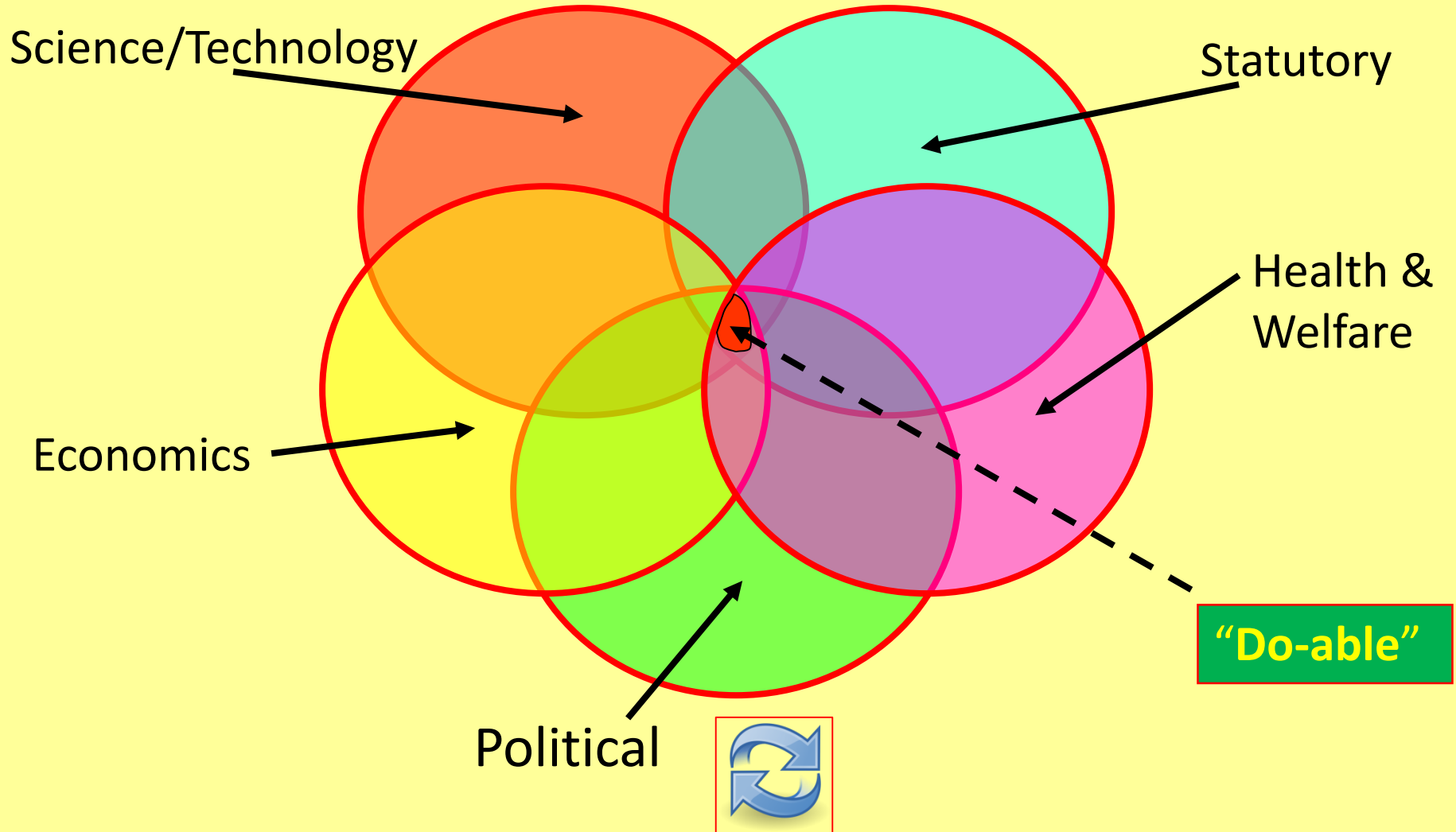


Biosecurity/Risk Audit Summaries

- Many risk similarities, many differences for RAS
- Trust but verify
- Plan for success, prepare for problems
- Assess, prioritize, act/react, audit, adjust



Overall Risk Continuum



Questions?

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