REGIONAL SHELLFISH SEED BIOSECURITY PROGRAM

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GUIDE TO RSSBP BEST MANAGEMENT PRACTICES

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1. Adult animals, i.e., broodstock, should be segregated from algal, larval, and post-set culture systems within the hatchery.

Hatchery facilities are all different - size, floorplans, species, water treatment, etc. Some may be relatively new constructions but most evolve overtime to improve efficiency or expand production. Because of these differences, there is no `one-size fits all' approach to broodstock segregation. The key for biosecurity is to contain untreated source water (a.k.a. raw water or ambient water), away from areas of treated water culture (algal, larval and post-set systems).

There are several common options to prevent mixing raw/untreated water with treated water. Some options might look nicer, but all of these methods are effective as demonstrated by health evaluations showing the products are routinely free of disease and Pathogens of Concern (POCs) are undetectable.

a. Broodstock is held in a separate room or in a completely separate building. Untreated tank water drainage is contained/diverted in some manner (floor drains, etc.) to avoid spilling out on the floor where it could easily come in contact with clean equipment (hoses, buckets) or be tracked throughout the facility.

b. Broodstock tanks (untreated water) are on one side of the hatchery with an adequate physical separation distance of several feet or more from treated water production areas to avoid contamination from splashing or aerosols. Untreated tank water drainage is contained/diverted in some manner (floor drains, etc.) to avoid spilling out on the floor where it could easily come in contact with clean equipment (hoses, buckets) or be tracked throughout the facility. In addition, a plan needs to be in place for moving broodstock in and out of the area without dripping untreated water on the floor where it could be tracked to the treated water production areas.

c. In addition to b. and in cases where the physical distance is limiting, plastic curtains or similar can be hung between the areas as a physical barrier. The bottom and top of the curtain would need to be semi-secure to assure it doesn't move. The purpose of the barrier is to protect against aerosol contamination from untreated water to the treated water production area.

d. All equipment used in the broodstock holding area is kept separate from or thoroughly cleaned before leaving the broodstock room (also covered in BMP #7).

Care is also required to maintain biosecurity when spawning broodstock. Biosecure practices include:

- Rinsing the broodstock in fresh water before moving it to the spawning area to remove POCs that may be on the shell.
- Rinsing eggs in treated seawater before and/or after fertilization as some POCs will be released during strip spawning and may be released during natural spawning
- Dedicated spawning equipment (cups, sieves, shucking knives, etc) that are disinfected and kept separate from the treated water production areas
- Properly disposing of used broodstock or shells outside the treated water production area.
- Special care should be made to isolate or decontaminate personal equipment such as gloves, boots (separate sets of gear, or a foot bath at the entrance/exit of the area, etc.).

2. Algal, larval and post set systems should be adequately separated from areas with animals or equipment previously exposed to untreated water to avoid splashing and cross contamination.

These practices reiterate the information above from the perspective of the clean products as they are produced. Once again, the key is avoiding the spray/splash/aerosol transfer or tracking of untreated source water (a.k.a. raw water or ambient water) into areas of treated water culture (algal, larval and post-set systems). The mechanisms described above to separate broodstock apply here with the focus on preventing untreated water from entering the areas of treated water cultivation.

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a. Hold Broodstock a separate room or in a completely separate building from treated culture systems. Contain/divert untreated tank water drainage in some manner (floor drains, etc.) to avoid spilling out on the floor where it could easily come in contact with clean equipment (hoses, buckets) or be tracked throughout the facility.

b. Locate Broodstock tanks (untreated water) are on a separate side of the hatchery with an adequate physical separation distance of several feet or more from treated water production areas to avoid contamination from splashing or aerosols. Contain/divert untreated tank water drainage in some manner (floor drains, etc.) to avoid spilling out on the floor where it could easily come in contact with clean equipment (hoses, buckets) or be tracked throughout the facility. In addition, a plan needs to be in place for moving broodstock in and out of the area without dripping untreated water on the floor where it could be tracked to the treated water production areas.

c. In addition to b. and in cases where the physical distance is limiting, plastic curtains or similar can be hung between the areas as a physical barrier. The bottom and top of the curtain would need to be semi-secure to assure it doesn't move. The purpose of the barrier is to protect against aerosol contamination from untreated water to the treated water production area.

d. All equipment used in the broodstock holding area is kept separate from or thoroughly cleaned before leaving the broodstock room (also covered in BMP #7).

3. Water treatment to prevent pathogen exposure during early life stage cultivation should employ a series of filters to get to 1µm filtration, or demonstrate another means to minimize the risk of pathogen exposure from source water (e.g., pasteurization, well water, etc.).

Source water will differ among facilities in sediment, biological loads and other factors. Water quality also varies seasonally, and with events such as storms and algae blooms. This means water treatment requirements may also change over the course of a season. There are also physical considerations such as the distance source water travels to the facility and the volume of water being pumped that may impact treatment effectiveness or efficiency. Therefore, there is no `one size fits all' approach to water treatment. While facilities will differ in how this is achieved, the **requirement** is to demonstrate that water used for larval and early post-set cultivation has been adequately filtered to 1 um or otherwise treated (e.g., pasteurized) or sourced (e.g., well water or artificial sea water) to minimize pathogen exposure.

Auditors will `follow the water' – starting where it enters the facility and following the path as it moves through filtration or treatment and to the different production systems, looking for clear separation of treated and untreated water.

4. Cleaning of water filters or other water treatment apparatus should be conducted in an area separate from treatment areas or any areas containing treated water to avoid cross contamination.

There are a variety of filter types – string filters, cartridge filters, sock and bag filters. The number of uses or the frequency of cleaning will vary based on the quality of the source water. The hatchery should either have a protocol for cleaning to ensure filters do not become clogged or a warning system to alert operators that filters are not functioning properly. Cleaning should be conducted in an area that prevents waste water from contaminating treated water, including via spray, splash or aerosol. Many facilities designate a place outside for this activity. Workflow is an additional consideration to avoid risk of contamination from this activity – employees cleaning filters should not be going back into the treated water areas without changing aprons and cleaning shoes, arms, etc.

5. Records should be kept indicating maintenance of systems to eliminate POCs from source water (e.g., filter change regimes, relative "age" of all active filters). Labels on equipment indicating maintenance are strongly recommended to alert all staff of needs.

While maintenance needs will differ among facilities and across seasons, every facility should have a standard operating procedure in place that is specific to their needs and **record** individual equipment inspections to ensure equipment is functioning as desired. Standard operations should record details such as:

- The maximum number of days / passes before equipment is cleaned
- A number of cleanings before filters are replaced
- Backwashing schedules for the appropriate filtration systems and a schedule of when media are replaced.
- UV filtration should include monitoring and a bulb replacement schedule.
- Testing data where applicable

6. Workflow and operational plans should be designed to prevent the introduction of raw water and contaminants from entering areas where cultivated life stages are in treated water.

Workflow is critical. Each facility should have a plan in place that ensures POCs are not being transferred from staff working with untreated source water to the clean/treated production areas.

Transfers can be from staff hands, arms, clothes, aprons, shoes, or equipment that have come in contact with untreated source water.

Plans will depend on the size of the facility, number of staff, and general operations. Examples of elements that should be considered:

- Functional separation of workers – workers are assigned to perform tasks separately. For example, maintenance of broodstock (untreated source water) should be conducted separately from larval cultivation (treated production) without switching back and forth as every switch requires cleaning and decontamination increasing the risk of transfers. This could be on a full-time, or daily basis.

- Assigning tasks that involve working with untreated source water (field/nursery/broodstock) to the end of the day after staff have finished in the treated production areas. This may be more realistic for smaller operations with limited staff.

- Designating particular gear (aprons, boots, etc.) for staff working with untreated source water which will only be worn during these tasks and doesn't leave the untreated area.

- Implementing cleaning/disinfecting procedures for entering treated production areas such as washing hands/arms, using disinfectant shoe baths.

- Conducting staff training on the importance of separating untreated source water and treated water with the purpose of not introducing POC/disease. Training frequency depends on numbers of staff and turnover rates. Training could be informal – a seasonal staff meeting / review rssbp.org - or be a more formal training program with a manual of printed Standard Operating Procedures (SOPs).

- Posting signs and/or restricting access to treated production areas to minimize traffic through these areas.

7. Equipment should be assigned to specific operational areas (e.g., containers used to transport adult animals, should be used only for such tasks) or effectively sanitized between uses when shared.

Use designations for equipment such as buckets, sieves, hoses, etc. should be readily identifiable - in a separate building/room or labeled for a specific task or production area. For shared equipment, a sanitation protocol should be implemented.

8. Health examinations should be conducted on animals experiencing unexplained, atypical mortality and records kept. This maintains the Program's ability to stay alert to possible emerging pathogens as well as POCs. The Shellfish Health Advisory Council must be notified of any disease issues that come up during Program participation including any actions taken to rectify the situation.

Facilities should develop a relationship with an RSSBP-approved shellfish pathologist. Larval mortality is complex and can be attributed to a number of factors that may or may not involve pathogens of concern (POCs). In cases where there is not an obvious reason for mortality (a pump failed, or not enough feed, etc.), a sample should be sent for testing to rule out a POC/disease issue. Sending samples doesn't count against operators, rather it demonstrates appropriate biosecurity measures are in place. Ruling out POCs/disease is critical to mitigate product loss and disease spread.

9. Broodstock records must be maintained and document source location (source water), genetic background, and collection date.

Records can be physical (paper) or digital. The importance is to help determine the source of problems when they occur. Participating facilities must demonstrate record retention and ensure frequency of record keeping. Records should be available and maintained for all broodstock batches that identify the number of individuals, the species, and source, which should indicate if it is wild or selected and the specific origin. That is, NJ or VA is not adequate, but Rutgers Cape Shore facility -Lower Delaware Bay or Virginia Institute of Marine Science- Yorktown, VA – Lower York River, is adequate.

10. Spawning records must be maintained that document specific broodstock used based on the broodstock records, spawn code/name, and date spawned in order to accommodate any trace back from health certification results.

Records can be manual (paper) or digital. The importance is to demonstrate record retention and ensure frequency of record keeping. This information will flow from BMP #9.

11. If applicable, quarantine practices must be demonstrated and documented for all non-local endemic species of broodstock.

A quarantine protocol should be on hand for any facility handling non-local broodstock.

12. All Federal, State and Local permitting requirements, such as hatchery facility permits must be followed. Non-compliance with State requirements will result in removal of the hatchery from the RSSBP.

Not all states require hatcheries to have a facility permit. The hatchery operator is responsible for obtaining the required state permitting and by signing the application form, is acknowledging compliance. The Project team will cross check the application with the state regulatory guidance document.