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Keeping the Nursery Clean: A Practical Guide to Disease Prevention in Marine Finfish Hatcheries

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In a marine finfish hatchery, a disease outbreak can take out a whole larval batch in a few days. Fry from that batch can then carry the infection to every farm that stocks them. Prevention is far cheaper than cure. Few antibiotics are practical for larvae, and no drug cures a virus. The viral disease that worries seabass, grouper and pompano farmers most is viral nervous necrosis (VNN), caused by betanodavirus. It is especially severe in larvae and juveniles, so the hatchery is where it must be stopped. The best protection is a layered approach, as the reviews on viral diseases in marine fish also conclude. A multifaceted strategy of biosecurity, good husbandry, surveillance and vaccination works better than relying on any single measure. This article walks through four layers in the order a fish, egg or drop of water meets them: quarantine, water filtration, feeding practices, and Good Manufacturing Practices (GMPs).

Quarantine: stopping trouble at the gate

Quarantine means holding new arrivals apart until you know they are healthy. The main entry points for disease are broodstock, eggs or larvae from outside, seawater, live feed, equipment and people. Biosecurity reviews for marine aquaculture put broodstock, nursery and hatchery biosecurity at the head of their disease-management recommendations.

Broodstock quarantine

1. **Source selection.** Take broodstock from sources with known health records. Avoid mixing batches from different origins.

- **Isolation.** Hold new fish in a separate quarantine unit with its own water supply, drainage, nets and tools. Water must not flow from quarantine into the main hatchery.
- **Observation period.** A holding period of about 2–4 weeks is common practice. Check behaviour, appetite, skin, gills and mortality daily.
- **Screening.** Test a sample for key pathogens, especially betanodavirus by RT-PCR, as well as bacteria and parasites. Gonadal tissue and reproductive fluids matter because NNV can pass from parent to offspring.
- **Treatment and acclimation.** Do prophylactic baths or parasite treatments only if the health plan calls for them. Move fish to the broodstock system only after they clear screening.
- **Records.** Log every batch with its source, dates, test results and mortalities.

Quarantine for eggs, larvae and people

Eggs from outside should also be quarantined and disinfected. Ozone treatment of fertilised eggs is well studied: ozonated seawater inactivated nodavirus on halibut eggs and improved larval survival. Ozone dose is critical because eggs tolerate it only within limits. Staff and visitors need footbaths or foot dips, hand disinfection and dedicated clothing at each zone. Hatchery staff should work from the cleanest zone to the dirtiest, never the reverse.

Table 1. Quarantine checklist for a marine finfish hatchery

Item	What to do	Why it matters
Broodstock intake	Separate unit, 2–4 weeks hold, PCR and clinical screening	Stops vertical and horizontal pathogen entry
Eggs from outside	Surface disinfection (ozonated seawater or iodophor) before incubation	Egg surfaces can carry nodavirus
Water and drainage	Separate supply and effluent treatment for quarantine	Prevents cross-contamination
Equipment	Dedicated nets, buckets and siphons, colour-coded per zone	Fomites spread disease
People	Footbaths, hand dips, zone-specific clothing	Staff are a major carrier route
Dead or moribund fish	Remove daily; bury with lime or incinerate	Removes a pathogen source
Records	Batch ID, source, test results, mortality log	Allows traceback if an outbreak occurs

Water filtration and disinfection: cleaning the medium

Larvae live in their water, so the intake system is the most important engineered defence. The standard design is a treatment train that removes particles first, then kills what remains. Disinfection works much better on clean water, because particles shield microbes from UV and soak up ozone.



Drum filter



Protein skimmer

The treatment train

- **Coarse and sand/drum filtration** removes silt, plankton and larger organisms, typically down to about 20–40 µm.
- **Cartridge or bag filtration** polishes the water in stages, for example 20 → 10 → 5 → 1 µm. Disinfection works better on this clearer water.
- **Protein skimming (foam fractionation)** removes dissolved organics and fine particles, which lightens the load on UV and ozone. Combined with ozone it is very effective.
- **Ozone and/or UV disinfection.** Both inactivate bacteria and many viruses. Experimental work showed ozone inactivates striped jack nervous necrosis virus (SJNNV) and that treating seawater and washing fertilised eggs lowered VNN occurrence.
- **Activated carbon or de-ozonation** removes residual ozone and oxidants before the water reaches larvae. This step is essential for animal safety.

Practical points for operators: ozone is harmful to fish and staff and must be fully removed before water reaches the tanks. UV effectiveness depends on lamp age, water clarity and flow rate. Viruses typically need higher doses than bacteria. Treatment capacity should be verified by testing, not assumed.

Table 2. Typical treatment stages in a marine finfish hatchery

Stage	Typical target	Main role	Cautions
Sand / drum filter	Removes particles about 20–40 µm	Bulk solids removal	Backwash regularly; keep clean
Cartridge / bag filters	20 → 10 → 5 → 1 µm	Polishing before disinfection	Replace on a schedule; disinfect housings
Protein skimmer	Foam removes dissolved organics	Reduces organic load	Needs tuning and cleaning
Ozone (water)	Dose set by TRO and contact time	Inactivates bacteria, viruses	Toxic; must be removed before the tanks
Ozone (eggs)	Species-specific: halibut eggs tolerated 4 mg/L for 0.5 min but hatching fell at ≥1 min	Surface disinfection of eggs	Over-dosing harms eggs; validate per species
UV	Dose in mJ/cm² (viruses need more than bacteria)	Final barrier	Clear water and lamp maintenance needed
Carbon / de-ozone	Remove residual oxidant	Protects larvae	Replace media periodically

Feeding habits: the hidden route for disease

Feed is often overlooked as a disease route. Larvae rely on live feeds such as rotifers and *Artemia*, which are filter feeders. They also carry into the larval tank whatever bacteria were in their culture water. Culture conditions for live feed tend to favour opportunistic microbes, and *Vibrio* is often prominent. Poor control of this flora is one reason survival varies so much from batch to batch.

Changes in feeding practice that reduce disease

- **Clean live-feed cultures.** Use treated, filtered water. Keep culture vessels, air lines and harvesting gear disinfected between batches. Avoid overfeeding and crashes in rotifer culture.
- **Wash and rinse before feeding.** Harvest rotifers and *Artemia* and rinse them with clean seawater before transfer to larval tanks.
- **Disinfect *Artemia* cysts and nauplii.** Cysts are commonly decapsulated or disinfected before hatching to cut bacterial and fungal load.
- **Aim to shift the flora, not sterilise it.** Disinfection lowers bacterial load but opportunists regrow quickly. A better goal is to change the microbial community, for example by bioencapsulating probiotics in live feed for a short period.
- **Enrich properly.** Marine larvae cannot make enough highly unsaturated fatty acids (HUFA), so these must come through the live feed. Enriching rotifers and *Artemia* with HUFA, vitamins, minerals and probiotics improves fish health and survival. Well-nourished larvae resist infection better.
- **Avoid waste.** Uneaten feed fuels bacterial blooms. Feed little and often according to larval stage, and remove debris and dead larvae by siphoning.
- **Wean carefully.** Formulated microdiets can reduce dependence on live feed and the microbial load it carries. Introduce them gradually with co-feeding, since weaning is a stressful stage.
- **Use treated feed handling.** Store dry feeds sealed, cool and dry, and discard expired or mouldy feed. Never use raw fish or trash fish in larval systems.

Table 3. Feed types and their disease-prevention roles

Feed	Disease-related risk	Prevention measure
Microalgae (green water)	Can carry bacteria if poorly cultured	Use clean, tested starter cultures and treated water
Rotifers (*Brachionus*)	Carry opportunistic bacteria such as *Vibrio*	Clean culture, rinse before feeding, probiotic bioencapsulation
Artemia nauplii	Cysts and nauplii can carry bacteria	Cyst decapsulation or disinfection, rinse, enrich appropriately
Copepods (where used)	Source water and culture risk	Treated water, hygiene
Formulated microdiets	Low if stored well; waste if overfed	Gradual weaning, small frequent rations, remove waste
Enrichment products	Nutrient and probiotic delivery	Proper HUFA, vitamin and probiotic enrichment



Rotifer



Artemia

Good Manufacturing Practices (GMPs): making prevention routine

Equipment and procedures protect a hatchery only if people follow them every day. GMPs turn good ideas into routine. A written biosecurity plan with standard operating procedures (SOPs) is the backbone, and biosecurity guidance for marine aquaculture recommends having one.

Key GMP elements

- **Zoning and workflow.** Separate broodstock, incubation, larval rearing, live feed and nursery areas. Keep one-way flow from clean to dirty. Use separate equipment for each zone.
- **All-in, all-out production.** Fully empty, clean, disinfect and dry tanks between batches. Don't mix age groups.
- **Cleaning and disinfection protocols.** Clean first, then disinfect, then rinse. Disinfectant works poorly on dirty surfaces.
- **Health monitoring.** Check larvae microscopically and log mortality daily. Use periodic PCR screening of broodstock, eggs and larvae. Continuous surveillance and early, accurate diagnosis are central to integrated disease management.
- **Training.** Train all staff in hygiene, SOPs and recognising early disease signs.
- **Records and traceability.** Keep batch, water, feed, treatment and mortality records. Traceback is how you find the source of an outbreak.
- **Responsible drug use.** Avoid routine antibiotics. Use only approved products under veterinary guidance and keep treatment records.
- **Waste and effluent.** Treat effluent and dispose of dead fish safely so the hatchery does not seed disease into the environment or other farms.
- **Emergency plan.** Define what to do when an outbreak occurs: isolate, notify, diagnose, depopulate if needed and disinfect.

- **Genetics and immunity.** Disease-resistant lines and nutrition that supports immunity complement hygiene. Vaccination, including against betanodavirus in Asian seabass and other species, adds protection but should be combined with biosecurity.

Studies of hatcheries have examined how NNV spreads and which risk factors are associated with it. Hybrid grouper hatcheries are one example in Malaysia. These show why on-site risk assessment matters.

Table 4. GMP checklist for daily and periodic operations

Area	Daily	Between batches	Periodic / annual
Tanks and gear	Remove debris and dead fish	Empty, clean, disinfect, dry	Inspect and replace worn items
Filters, UV, ozone	Check flow, pressure and alarms	Backwash and sanitise	Replace cartridges and lamps; validate dose
Live feed	Check culture quality; rinse before feeding	Disinfect culture vessels	Review enrichment and probiotic protocols
Fish health	Observe larvae; log mortality	Screen when indicated	PCR surveillance of broodstock and seed
People	Footbaths, handwashing, zone clothing	Reinforce SOPs	Biosecurity training and audits
Records	Update logs	Batch summary	Review plan, incident debrief

Putting it all together

No single barrier is perfect, but together they cut the chance that a pathogen enters, survives and spreads. In practice:

1. Keep pathogens out with **quarantine** and screening.
2. Make the water safe with a staged **filtration and disinfection** train.
3. Feed clean, well-enriched live and formulated diets in a way that doesn't feed bacteria.
4. Lock it in with **GMPs**, records and trained staff.

For high-value marine species, the aim is a hatchery that produces healthy seed with minimal drug use, protecting both the farms it supplies and the coastal environment.

References

1. Rhodes, L.D., Parrish, K.L. and Willis, M.L. (2023). Review of best practices for biosecurity and disease management for marine aquaculture in U.S. waters. NOAA Technical Memorandum NMFS-NWFSC-180. https://doi.org/10.25923/b4qp-9e65
2. Rhodes, L.D., Parrish, K.L. and Rub, M.W. (2023). Scientific support for health management and biosecurity for marine aquaculture in the United States. NOAA Technical Memorandum NMFS-NWFSC-186. https://doi.org/10.25923/55c9-ts52
3. Padrós, F., Caggiano, M., Toffan, A., Constenla, M., Zarza, C. and Ciulli, S. (2022). Integrated management strategies for viral nervous necrosis (VNN) disease control in marine fish farming in the Mediterranean. *Pathogens* 11(3): 330. https://doi.org/10.3390/pathogens11030330
4. Grotmol, S. and Totland, G.K. (2000). Surface disinfection of Atlantic halibut Hippoglossus hippoglossus eggs with ozonated sea-water inactivates nodavirus and increases survival of the larvae. *Diseases of Aquatic Organisms* 39: 89–96.
5. Arimoto, M., Sato, J., Maruyama, K., Mimura, G. and Furusawa, I. (1996). Effect of chemical and physical treatments on the inactivation of striped jack nervous necrosis virus (SJNNV). *Aquaculture* 143(1): 15–22. https://doi.org/10.1016/0044-8486(96)01261-6
6. Samat, N.A., Yusoff, F.M., Rasdi, N.W. and Karim, M. (2020). Enhancement of live food nutritional status with essential nutrients for improving aquatic animal health: a review. *Animals* 10(12): 2457. https://doi.org/10.3390/ani10122457

7. Mugimba, K.K., Byarugaba, D.K., Mutoloki, S., Evensen, Ø. and Munang'andu, H.M. (2021). Challenges and solutions to viral diseases of finfish in marine aquaculture. *Pathogens* 10(6): 673. https://doi.org/10.3390/pathogens10060673
8. Ahmad, A.K., Amal, M.N.A., Zamri-Saad, M. et al. (2019). Prevalence, risk factors and transmission of nervous necrosis virus in a hatchery producing hybrid grouper (*Epinephelus lanceolatus* × *E. fuscoguttatus*) fry. *Pertanika Journal of Tropical Agricultural Science* 42(1): 125–138.