CLEANING AND DISINFECTION

Water chemistry and quality in aquaculture.

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USE WATER QUALITY TO GUIDE THE PROCESS

Water carries cleaning agents to surfaces and removes loosened soil. Its chemistry and microbial quality can also affect the result. A reliable program matches the water, soil, surface and target pathogen to the selected products and application method. This guide covers equipment and facilities; treatment of live fish or eggs requires separate, specifically authorized directions.

DISTINGUISH THE THREE TASKS

Cleaning removes unwanted material, including organic residues and mineral deposits. Sanitizing reduces microorganisms to a level defined for a particular use, often food-contact surfaces. Disinfection inactivates susceptible pathogens under specified conditions. These terms and regulatory claims are not interchangeable, and none automatically means sterilization.

CHECK THE WATER AT THE POINT OF USE

Assess the source and any changes caused by storage, treatment or distribution. Relevant measurements may include hardness, alkalinity, pH, temperature, turbidity, iron, manganese and microbial quality. Choose tests according to the application and product requirements. Potable water is not necessarily sterile or free of all aquatic animal pathogens.

Water factor	Why it matters	Practical response
Hardness	Calcium and magnesium can form scale or interfere with some formulations.	Measure as specified, commonly mg/L as CaCO3; select a compatible product or treatment.
Alkalinity and pH	Alkalinity buffers pH changes; pH affects some active ingredients and corrosion.	Assess both when relevant. Check the prepared solution, not only the source water.
Organic matter and solids	Debris can consume active ingredients or shield microorganisms.	Remove solids and clean first; manage dirty water and spent solutions.
Iron and manganese	Deposits and staining may complicate cleaning; effects vary with chemistry.	Investigate the source and consider appropriate treatment.
Temperature	Changes reaction rates, cleaning performance and material compatibility.	Operate within the product and equipment limits.
Microbial quality	Water can introduce contamination during washing or final rinsing.	Use water suitable for the health status and intended application.

Do not assume a single acceptable water pH range guarantees performance for every cleaner or disinfectant.

MATCH THE CLEANER TO THE SOIL

Remove residues without damaging the surface.

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IDENTIFY WHAT NEEDS TO BE REMOVED

Aquaculture soils may contain mucus, feces, feed, fats, proteins, mineral scale and biofilm. Mixed deposits often need a planned sequence rather than one chemical. Remove loose debris promptly; drying and excessive heat can make some residues harder to remove.

Soil or deposit	Typical cleaning approach	Key limitation
Fat and oily residues	Use a compatible detergent with suitable emulsifying action; alkaline formulations may help with fats.	Temperature and chemistry must suit the surface and residue.
Protein and mucus	Use an appropriate alkaline or enzyme formulation with mechanical action.	Excessive heat can set protein soils. Not every protein film requires chlorine.
Sugars and starches	Water and detergent may remove soluble residues; mixed deposits can need stronger cleaning.	Starch behavior depends on processing, age and associated fats or proteins.
Mineral scale	Use a compatible acid descaler where justified.	Confirm the deposit and surface compatibility; never mix acid with chlorine products.
Biofilm and mixed films	Disrupt and remove deposits using appropriate cleaning and mechanical action.	Disinfection alone may leave the protective matrix or underlying soil.
Grease, sand and other debris	Remove particles physically; use an appropriate surfactant cleaner for oily residues.	Avoid spreading contamination or using unsuitable solvents.

UNDERSTAND WHAT THE FORMULATION DOES

Surfactants improve wetting and help suspend or emulsify soils. Alkaline builders support removal of many organic residues; acid builders help remove suitable mineral deposits. Chelating or sequestering ingredients bind certain metals and can help manage hardness. Enzymes act on specific soil components within defined temperature and pH limits.

Use formulated products according to their instructions. Do not improvise blends of cleaners, enzymes, oxidizers or water conditioners. Compatibility and performance depend on the full formulation, not just the named active ingredient.

PROTECT THE EQUIPMENT

Check compatibility with stainless steel, aluminum, galvanized surfaces, plastics, seals, hoses and coatings. Chlorides, strong acids, strong alkalis and oxidizers may damage particular materials. Inspect for cracks, corrosion and roughness that retain contamination; repair or replace surfaces that cannot be cleaned reliably.

SELECT THE DISINFECTION METHOD

Use product evidence and application limits.

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CHOOSE FOR THE ORGANISM AND THE SETTING

Check the current local label, target organisms, intended surfaces, water conditions, contact time and application method. Laboratory results for an active ingredient do not establish equivalent performance for every commercial formulation. A food-contact sanitizer claim does not establish suitability for aquaculture equipment, fish or eggs.

Method or family	Useful characteristics	Checks and limitations
Hypochlorites	Widely used oxidizing disinfectants.	Organic load consumes activity. pH affects chlorine chemistry; assess corrosion and residuals. Never mix with acids or ammonia.
Chlorine dioxide	Oxidizing treatment used in specific authorized systems.	Requires product-specific generation, measurement and safety controls. Do not substitute it directly for hypochlorite.
Iodophors	Iodine formulations used for specified disinfection applications.	Activity, staining, compatibility and pH limits depend on the formulation and use.
Quaternary ammonium compounds	Surface-active disinfectants for specified organisms and applications.	Spectrum varies; detergent residues may interfere. Check hardness tolerance, rinsing and aquatic toxicity.
Hydrogen peroxide	Oxidizing agent in a range of formulated products.	Efficacy depends on formulation and conditions. Concentrates can cause serious injury; assess materials and residual exposure.
Peracetic acid and other peroxygen products	Oxidizing formulations with application-specific efficacy.	Do not assume universal soil tolerance, corrosion resistance or pH limits. Follow compatibility, ventilation and handling requirements.
Other formulated sanitizers	Acid-anionic, fatty-acid and other products serve particular applications.	Use only for the claims, surfaces and operating conditions supported by the product.
Hot water or steam	Can provide thermal disinfection in suitable systems.	Verify actual surface temperature and exposure time, including cold spots. Check burn hazards and heat-sensitive components.

AVOID UNIVERSAL DOSES AND NO RINSE ASSUMPTIONS

There is no single safe concentration or contact time for a chemical family. Historical food-processing limits should not be applied to current products or aquaculture uses. A no-rinse claim applies only to its specified conditions; it does not mean residues are harmless to fish or receiving waters.

Chlorine gas is toxic and is not mustard gas. Acidifying hypochlorite can release chlorine gas. Never adjust bleach pH by adding acid; use only the authorized preparation procedure.

CONTROL THE COMPLETE PROCESS

Verify the result before returning to service.

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01 PREPARE AND ISOLATE

Identify the surfaces and target risks. Isolate the work area from stock, clean equipment and sensitive water systems as appropriate. Plan safe chemical handling, ventilation, protective equipment and collection of waste. Follow equipment isolation requirements before maintenance or entry.

02 REMOVE DEBRIS AND CLEAN

Remove loose material, then apply a cleaner appropriate to the soil and surface. Use mechanical action where needed and reach seams, drains, hoses and other difficult areas. Avoid spreading contamination with high-pressure spray. Rinse as required and inspect; repeat cleaning if residues remain.

03 SEPARATE INCOMPATIBLE CHEMISTRIES

Follow product instructions for intermediate rinsing, draining or neutralization. Define a suitable endpoint with the supplier or technical team when changing between incompatible products; it may require more than visual inspection. Never use uncontrolled acid–alkali mixing as a neutralization method.

04 PREPARE AND APPLY THE DISINFECTANT

Use suitable water and calibrated measuring equipment. Follow the specified dilution and mixing order. Use a product-appropriate concentration check where required. Provide complete coverage and maintain the required contact conditions; for wet-contact applications, keep surfaces wet for the labeled time.

05 RINSE DRAIN OR DRY AS DIRECTED

Complete the product and equipment requirements for rinsing, neutralization, draining and drying. Use rinse water of suitable quality. Prevent recontamination during storage or reassembly. Confirm that equipment is safe for contact with fish, eggs or production water before reuse.

06 VERIFY AND DOCUMENT

Record the product, preparation, measured concentration, contact time and operating conditions. Verify cleaning by inspection and suitable tools. Where sampling is justified, agree collection, residual neutralization and interpretation with a laboratory. A negative test alone does not prove pathogen freedom.

MANAGE WORKER AND ENVIRONMENTAL EXPOSURE

Keep chemicals labeled and segregated; follow the safety data sheet for storage, spills and first aid. Do not assume that dilute solutions are harmless or that products described as biodegradable can be discharged without controls. Manage spent solutions, solids and rinse water under applicable discharge and waste requirements.

Assess relevant effluent properties, including residual oxidants, pH, organic load and salinity. Dilution alone may not meet permit requirements; use an authorized treatment and verification process.

Reassess after changes in water, equipment, soil, pathogens or products. Train staff and investigate recurring failures before increasing chemical use.

IMPORTANT: General educational guidance only. Develop site-specific procedures with your aquatic animal health professional, chemical supplier and relevant technical specialists. Follow current local labels, safety data sheets and regulatory requirements.

REFERENCES: WOAH Aquatic Animal Health Code, Disinfection of aquaculture establishments and equipment; UF/IFAS, Basic Elements of Equipment Cleaning and Sanitizing; CDC, Chemical Disinfectants (general chemistry); EPA, disinfectant label and contact-time guidance. Updated October 2026.