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Prevent, but verify

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By Brett Koonse

Food safety concept combines best practices, monitoring



Each farm should have a written program that describes how it prevents food safety problems and a program that verifies the preventive measures are working.

“Trust, but verify” was a signature phrase adopted and made famous by former United States President Ronald Reagan. He often used this expression when discussing missile disarmament with the former Soviet Union.

For seafood safety, modifying “trust, but verify” to “prevent, but verify” can illustrate a systemic approach to ensuring the safety of aquaculture seafood. It essentially means developing and implementing a food safety program that prevents food safety hazards from occurring at the production site, then verifies that the prevention program works.

Seafood safety

The need for a “prevent, but verify” program in aquaculture is clear and universal. Whether caught in the open ocean or farmed, seafood is considered some of the safest and most nutritious food available. However, several food safety hazards are uniquely associated with raw aquaculture products.

The two main hazards associated with raw aquaculture products are the presence of residues of unapproved or prohibited antibiotics or chemicals, and contamination from pathogens such as Salmonella. These hazards usually originate at the farm and can remain in or on the product through the normal washing, sorting and packaging done at processing facilities.

Governments, buyers, importers and others routinely test aquaculture seafood for the presence of these hazards, and each year they find products that contain unsafe residues and pathogens. Table 1 summarizes chemotherapeutic testing by the United States Food and Drug Administration (FDA) during a three-year period. The term “violative” means the product or condition did not comply with U.S. laws or associated regulations enforced by the FDA.

Koonse, Summarized results from the Chemotherapeutics, Table 1

Fiscal Year	Countries Associated With Samples	Number of Samples	Number of Analyses	Number of Violative Samples	Violative Samples by Drug, Product
2004	16	622	702	28	Chloramphenicol – shrimp: 6, crab: 22
2005	21	536	587	28	Chloramphenicol – shrimp: 3, crab: 10
2005	21	536	587	28	Nitrofurans – shrimp: 3
2005	21	536	587	28	Fluoroquinolones – basa: 9
2005	21	536	587	28	Malachite green – basa: 2, eel: 1
2006	20	588	647	71	Chloramphenicol – shrimp: 2, crab: 7
2006	20	588	647	71	Nitrofurans – shrimp: 6
2006	20	588	647	71	Fluoroquinolones – basa: 2, grouper: 1, tilapia: 1
2006	20	588	647	71	Malachite green – basa/catfish: 15, eel: 29, grouper: 3, tilapia: 3, dace: 1

2006	20	588	647	71	Quinolones: salmon: 1
2007	20	686	900	49	Chloramphenicol – crab: 7
2007	20	686	900	49	Nitrofurans – shrimp: 8
2007	20	686	900	49	Fluoroquinolones – basa/catfish: 6
2007	20	686	900	49	Malachite green – basa/catfish: 12, eel: 8, tilapia: 2, dace: 2, salmon: 1
2007	20	686	900	49	Crystal (gentian) violet – catfish: 2, shrimp: 1

Table 1. Summarized results from the Chemotherapeutics in Seafood Programs, 2004 to 2007.

Not only are these hazards a risk to public health, but they can cause serious economic hardships throughout the supply chain. For example, if an aquaculture product is found to contain unapproved or prohibited residues, this product can no longer be consumed and must be discarded.

The further the product has made it through the supply chain, the greater the number of businesses that could be adversely affected and the greater the direct monetary loss to the industry. This is particularly true if the hazard is identified after the product is in the marketplace, and a recall is required.

These food safety problems can also cause a loss of trust with suppliers and consumers, which in turn could result in the loss of future business.

Prevention, certification

Of course, if proper preventive controls are in place, it is highly unlikely a problem would be detected. This means consumers would be safer, there would be fewer product recalls, suppliers and the entire aquaculture industry would have improved reputations, and more product would make it to market.

Another element of the aquaculture producing and processing industry is the various third-party certification programs that many large buyers of aquaculture seafood require. It has been estimated that there are now more than 30 different certification schemes for aquaculture. They are usually market- or customer/buyer-driven and address four areas of concern: food safety, sustainability, social responsibility and animal welfare.

Food safety program

Each farm, production site or cluster of small farms should have a written program that clearly describes how it is going to prevent food safety problems and a program that verifies the prevention program is working.

The prevention program could include developing and implementing standard operating procedures and a farm HACCP plan, or implementing a recognized program of best management practices.

No matter which program or combination of programs is used, it must be adjusted for each specific farm based on factors such as the product being cultivated, the location of the farm, the laws and regulations within the country and the intended market.

Attributes of prevention

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Seafood safety practices must be applied post-harvest, as well as throughout the production process.

general, 11 attributes should be considered when developing a food safety prevention program for an aquaculture farm.

- **□ Farm site selection and monitoring.** Locate farms away from contaminated industrial sites and pollution sources such as sewage treatment outfalls. Perform subsequent monitoring to assure the site and products do not become contaminated.
- **□ Sewage and pollution control.** This attribute includes the proper disposal of sewage and wash water at a farm or farm site, and an adequate number of properly installed restroom facilities for workers.
- **□ Personnel practices.** Farm facilities need to have employee hygiene and sanitation programs that include training employees; monitoring and verifying that employees wash their hands, have clean outer garments, do not work while sick, etc.
- **□ Harvesting and transport.** Proper equipment and techniques to minimize contamination are required during the harvest and transportation of products. These include boats or trucks for live or dead transport, nets or materials used for harvesting, and totes or containers used to transport product.
- **□ Post-harvesting.** Proper equipment and techniques are needed for the sizing, sorting, grading and packing that occur at farm sites prior to the transport of product to a processing facility.
- **□ Ice and water.** Water used for ice and on product for transport, chilling and holding must come from safe sources.
- **□ Equipment construction, maintenance and control.** The equipment used during husbandry at broodstock facilities, hatcheries and grow-out sites, and during transportation of fry, postlarvae, eggs and smolts must reflect proper construction, maintenance and control. This point also includes such things as pond liners, cages, tanks, nets, aerators and antifouling agents.
- **□ Site control.** Access by animals or unauthorized personnel to hatchery facilities and growout ponds or cages that could contaminate an aquaculture farm must be controlled.
- **□ Feed control.** Feed should be carefully sourced, tested to assure it is free of contaminants, protected during storage and used appropriately. Feed contaminated by mold, heavy metals, polychlorinated biphenyl or other chemicals should not be used.
- **□ Drug and chemical use.** Only approved drugs and chemicals should be used with correct withdrawal times at aquaculture farms.
- **□ Record keeping,** Record one up, one back. Records should note sources and buyers, as well as all input materials, such as drugs, chemicals, feed, probiotics and vitamins. For example, record the name of the materials used, when they are used, why they are used, withdrawal times and how they are applied.

Verification



Inspections or audits conducted by government agencies or independent third parties can verify the correct implementation of seafood safety programs.

Several steps may be necessary to verify that a farm food safety prevention program is working. As for the prevention program, the attributes of the verification program depend on factors such as the product cultivated, the location of the farm and regulations within the country and intended market.

In general, verification centers around testing product to document problem prevention. However, it may also include obtaining guarantees from suppliers that feed is free from unapproved or prohibited residues or having independent audits or inspections done at farms, feed mills or hatcheries to ensure prevention programs are properly implemented at each site.

If rapid or screening test kits are used, be aware that the limited number of drug-screening kits available for aquaculture drugs may not be able to detect all of the metabolites of a parent drug. Be sure that rapid tests have been validated and are appropriate for the species and drugs targeted for detection. It is also recommended that you periodically verify the adequacy of rapid test methods and equipment by comparing their results with those obtained through methods recognized by the Association of Official Analytical Chemists or equivalent international groups.

Tests should be run for the drugs, chemicals or contaminants that are reasonably likely to occur in a specified product in a given area. This information can usually be obtained through discussions with local government officials, academic advisors and industry leaders.

Test frequency

The general rule is to test product quarterly, but testing frequency can vary depending on several factors. These factors include, but may not be limited to regulatory requirements, the depth of the prevention program, how long the program has been in place and the history of test results.

For example, the number of verification samples a farmer needs to collect and analyze can be minimized if a well-documented and developed prevention program is in place, and regulatory agencies require preharvest samples. It is also helpful when testing over many growout periods found no contamination, and the processor conducts its own residue tests.

However, it is important to have records that document the various verification efforts that occur on a farm. For example, if a government agency regularly tests a farmer's product or requires preharvest testing, the farmer should have copies of those test results.

Inspections, audits

Another technique to verify that food safety programs are implemented correctly is to have independent, credible inspections or audits conducted at farms. These inspections or audits may be conducted by a government agency or an independent third party.

The prevention programs themselves are examined during the reviews. Essentially, the audits determine if farms are “doing what they say they are doing” regarding prevention and verification, and that the programs are sufficient to assure product safety.

For example, an audit may look at whether a farm collects samples in line with the process and frequency described in its plans, or if a sufficient number of properly designed bathrooms are available for employees. Are related records complete, legible, available and adequate? Records of government and third-party audits must also be available.

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Author



BRETT KOONSE

U.S. Food and Drug Administration
Center for Food Safety and Applied Nutrition
5100 Paint Branch Parkway
College Park, Maryland 20740 USA

brett.koonse@fda.hhs.gov (<mailto:brett.koonse@fda.hhs.gov>)

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