

GOOD AGRICULTURAL PRACTICE
(GAP) FOR AQUAPONIC PRODUCE
AND GLOBAL FOOD SAFETY
INITIATIVE (GFSI) CERTIFICATION,
2020 UPDATE

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Good Agricultural Practices for Aquaponics

The Aquaponics industry faces a dual challenge:

- Not all growers acknowledge the need for GAPs
- Some regulators have unwarranted concerns about Aquaponics

Aquaponics can be done wrong

Though rare, aquaponics products can be unseemly or unsafe

- Untreated river water was added to a test system in New Zealand (Lennard)
- Unacceptable levels of pathogens observed in test systems (Pattillo)
- University of Hawaii research (2012-2015) resulted in suggested GAPs
- A Hawai'i farm was linked to instances of food borne illness (salmonella) in Nov 2016, but was cleared to resume production within the month
- A larval insect was found in produce sold by a different Hawai'i farm in Feb 2018

Brooks Aquaponics pioneered GAP efforts

- Under Dr. Savidov's direction, the Brooks Aquaponics project in Alberta, Canada, specifically investigated food safety
- Results were consistently negative for pathogenic contamination
- In 2011 Brooks Aquaponic facility applied for On-Farm Food Safety certification and was the first OFFS-certified aquaponics facility in Canada (GFTC Certificate. April 28, 2011)



Aquaponics removes pathogens over time

- When proper aquaculture protocols for solids removal are observed, pathogenic contamination of fish waters goes away over time (important since fish can't be "sterilized")
 - Reported by Dr. Lennard in New Zealand incident
 - Suggests designs that enable produce growth using hydroponics while fish waters return to safe status
- "7 logs of toxic strain of E coli were removed by mesophilic AD process* while ~ 5 logs increase of the strain were seen in water control with the same condition for 7 days" T. Gao*, T. Haine, A. Chen, Y. Tong, and X. Li, 2011

* Aquaponics

Key GAPs for Aquaponics (Savidov)

1) Worker sanitation

- a) No food/beverages in packing area
- b) Wash/sanitize hands, use gloves

2) Assess safety of all water, including ice

- a) Protect water from contamination from bird droppings, mammal feces
- b) Ensure hand performing clean harvest is not the hand touching questionable surfaces

3) Follow existing GAPs for produce

- a) Maintain pest control program
- b) Maintain and calibrate equipment regularly
- c) Manage waste properly
- d) Use proper packing materials, properly stored/protected
- e) Ensure transportation is clean and well-maintained

4) Ensure produce is tracked, to enable targeted recall in case of concern

FSMA Produce Safety Rule and Aquaponics

Various subparts of the Produce Safety Rule (PSR) are of interest:

- Subpart E relates to agricultural water that contacts harvestable produce portions, specifying requirements for microbial quality and testing
- Subpart F deals with raw manure in growth “matrices”, but does not consider liquid-only matrices to be growth media
- Subpart I deals with fecal contamination by domestic and wild animals, but does not apply to fish used in aquaponic operations
- Subpart K relates to harvest, including not harvesting contaminated produce (e.g. leafy greens that have been splashed with system water) and harvesting in such a manner as to protect against contamination

Food Safety Certification Entities

- Global GAP continues to certify Aquaponics
 - Juli Ogden, a GLOBALG.A.P. assurer, has developed Aquaponics-specific training built on her farmer-friendly “The Farm Plan”
- USDA Harmonized GAP still performs audits for aquaponic operations in the United States
 - US FDA reportedly acknowledges that aquaponic farming systems differ in important ways from non-aquaponic farming, however
 - FDA has agreed to neither exclude aquaponic farms from the FSMA Produce Safety rule nor prohibit growers from using aquaponic farming systems to grow produce covered by the rule

However...



Canada GAP to cease certifying Aquaponics

In July 2019 CanadaGAP announced their intent to cease certifying Aquaponics produce after March 31, 2020

- Farmers in Canada reported instances where certification was withdrawn in summer 2019, causing extreme hardship

CanadaGAP stated their concerns arose because researchers have posited pathogenic contamination and possible uptake of pathogens or pharmaceuticals in system water

- Pharmaceutical concern focuses on antibiotics

CanadaGAP concerns based on Hydroponics

Most concerns cited informally by CanadaGAP relates to research and reviews of research studies were based on hydroponics

- Madilizela et al., 2018, focused on antibiotics and hormones in hydroponics
- Herklotz et al., 2010, focused on antibiotics in hydroponics
- Reggio et al., 2019 was a review of research looking at internalization of pathogens in leafy greens grown hydroponically
- Yep and Zheng, 2019, was a literature review regarding concerns about produce grown in close proximity to fish and waste products

Cited concerns mischaracterized research by Dr. Savidov and the University of Hawaii as questioning the safety of aquaponics

Antibiotics are rarely used in aquaculture

Consumers are extremely concerned about use of antibiotics in mammals

- Concern is focused on antibiotic resistance in humans and development of antibiotic-resistant “super bugs”

Antibiotics are almost never used to treat fish

- Fish can't be given shots – antibiotics would need to be in the feed
- The cost to produce fish feed with antibiotics included is prohibitive
- The cost to get antibiotic-laced feed approved is prohibitive

Only reported use is a Chinese producer using antibiotics with high mortality fry

Antibiotics damage nitrifying bacteria

Use of antibiotic feed for fish in an aquaponic system would damage the nitrifying bacteria, destroying the natural process at the heart of a profitable aquaponic system

Aquaponic farmers have no motive (and rarely even the ability) to use antibiotics in fish feed

Pathogenic concerns overblown

Research at Brooks Aquaponics in Alberta consistently demonstrated the Aquaponics could be safe

Gao et al., 2011, demonstrated Aquaponics removes *E. coli* by ~7 log over seven days while *E. coli* increased by ~5 log in the water control (akin to hydroponics) during the same period

A three year investigation of food safety in Aquaponics funded by USDA at the University of Hawaii found “Though concern about food safety related to aquaponic vegetable production is understandable, **aquaponic produce and fish have been shown to be consistently safe** (Rakocy, 2003; Chalmers, 2004).”

Summary

Ensuring safe food production should be a focus of every aquaponic farmer

There are certifying protocols farmers can use to reassure consumers

- In the United States, farmers can use FDA Harmonized GAP
- All aquaponic farmers can use GLOBALG.A.P.

CanadaGAP's 2019 decision to cease aquaponic certification is not reasonable

- Aquaponic farmers can't afford to use antibiotics
- Postulated pathogenic uptake mitigated by mesophilic nitrifying bacteria
- Long-term studies show that aquaponic farms have been consistently safe