Scientific Challenges and Cost-Effective Management of Risks Associated with Implementation of Produce Safety Regulations

# Key Takeaways
# "Agricultural Water Treatment: It's Not Rocket Science… Or Is It?"

December 3, 2021 | Produce Safety Webinar Series Summaries (#02)

Alexis M. Hamilton, Laura K. Strawn, Michelle D. Danyluk, Lupe Camarena, LaTaunya Tillman, and Channah M. Rock

**Top 10**

1. FDA Environmental Assessment Reports that were published after investigations of foodborne illness outbreaks have implicated irrigation water as a potential source of outbreak pathogen strains.
2. There is no EPA-approved chemical treatment of production agricultural water for reducing microbiological indicators (like *Escherichia coli*) or other pathogens; however, several scientific studies exist.
3. Recent guidance from FDA and EPA suggests that limits for control of foodborne pathogens or indicators should achieve a 3-log reduction.
4. Effective water treatment requires that growers understand the starting quality of agricultural water, including its chemical, microbiological, and physical components and how these could be impacted by environmental factors, which is where conducting a risk assessment may help. It is also important to understand how variability in a grower's water source (microbiological and chemical) will impact water treatment technologies selected. Parameters such as pH, temperature, turbidity, and microbiological loading are all important to understand when selecting a water treatment chemical or device.
5. The most commonly used chemicals/devices used to treat agricultural water include the following: Peroxyacetic Acid (PAA), Calcium and Sodium Hypochlorite, Chlorine Dioxide, and Ultraviolet (UV) light.
6. The relationships between a grower's operation and its chemical supplier(s) and Extension professionals are key to maintaining a successful water treatment program as they can inform growers on what chemistries/devices would work well for their water source, identify monitoring parameters and frequency of monitoring to ensure proper treatment, and review data to better understand treatment efficacy.
7. Effectiveness of agricultural water treatment chemicals/devises may be negatively impacted by the addition of crop products to the water, so growers may need to evaluate these interactions.
8. Testing remains an important component in verifying that an agricultural water treatment system is working as intended. This may include microbiological testing for indicators (total coliform bacteria and generic *E. coli*) as well as residual chemical monitoring (ppm or mg/L) in treated water.
9. If water treatment is conducted by a grower as a mitigation measure, documentation is critically important to demonstrate that the agricultural water treatment selected is working as intended and to identify any deviations or corrective actions needed.

10. Growers throughout the country are rising to the challenge and treating water effectively to reduce potential risks to produce from agricultural water.

## Acronym Key

EPA: Environmental Protection Agency
FDA: Food and Drug Administration

## Additional Questions and Answers

For any questions that were not addressed during the Q&A at the live webinar, please review the "Remaining Questions from 'Agricultural Water Treatment: It's Not Rocket Science…Or Is It?'" document on the CONTACT website.

## Additional Reading

Acheamfour CL, Parveen S, Hashem F, et al (2021). Levels of Salmonella enterica and Listeria monocytogenes in Alternative Irrigation Water Vary Based on Water Source on the Eastern Shore of Maryland. Microbiol Spectr 9:e00669-21. https://doi.org/10.1128/Spectrum.00669-21.

Arizona Leafy Greens Marketing Agreement (2020). Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens. https://www.arizonaleafygreens.org/_files/ugd/cdf4b0_00a96ec5bbcd4975b7e4236145659920.pdf.

Bottichio L, Keaton A, Thomas D, et al (2020). Shiga Toxin–Producing Escherichia coli Infections Associated With Romaine Lettuce—United States, 2018. Clin Infect Dis 71:e323–e330. https://doi.org/10.1093/cid/ciz1182.

California Leafy Greens Marketing Agreement (2021). Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens. https://lgmatech.com/wp-content/uploads/2020/08/Current-version_August-2021-CA-LGMA-Metrics_FINAL-v20210818-clean-1262021.pdf.

Cooper K, Bright K, Rock C, Betancourt W (2022). Microbial characterization of irrigation waters using rapid, inexpensive and portable next generation sequencing technologies. In: Cent. Prod. Saf. Funded Res. Proj. https://www.centerforproducesafety.org/researchproject/473/awards/Microbial_characterization_of_irrigation_waters_using_rapid_inexpensive_and_portable_next_generation_sequencing_technologies.html.

Gelting RJ, Baloch MA, Zarate-Bermudez MA, Selman C (2011). Irrigation water issues potentially related to the 2006 multistate E. coli O157:H7 outbreak associated with spinach. Agric Water Manag 98:1395–1402. https://doi.org/10.1016/j.agwat.2011.04.004.

Krishnan A, Kogan C, Peters RT, et al (2021). Microbial and physicochemical assessment of irrigation water treatment methods. J Appl Microbiol. https://doi.org/10.1111/jam.15043.

Office of the Federal Register (2011). Food Safety Modernization Act. http://www.gpo.gov/fdsys/pkg/PLAW-111publ353/pdf/PLAW-111publ353.pdf.

Rock C, Brassill N, Carr D (2019). CPS 2017 RFP Final Project Report: UA Ag Water app-language expansion and practical grower-inspired improvements. Center for Produce Safety. https://www.centerforproducesafety.org/amass/documents/researchproject/421/CPS%20Final%20Report%20-%20Rock_February%202019.pdf.

Rock C, Cooper K, Yemmireddy V, Castillo A (2021). CPS 2019 Agricultural Water Treatment RFP Final Project Report: Agriculture water treatment - Southwest region. Center for Produce Safety. https://www.centerforproducesafety.org/amass/documents/researchproject/455/CPS%20Final%20Report_Rock%20%28AWT%29%20-%20September%202021.pdf.

Rock CM, Gerba CP, Bright KR, Tamimi A (2016). CPS 2013 RFP Final Project Report: Evaluation of risk-based water quality sampling strategies for the fresh produce industry. Center for Produce Safety. https://www.centerforproducesafety.org/amass/documents/researchproject/365/CPS%20Final%20Report_Rock_January%202016.pdf.

U.S. Food and Drug Administration (2018). Environmental Assessment of Factors Potentially Contributing to the Contamination of Romaine Lettuce Implicated in a Multi-State Outbreak of E. coli O157:H7. U.S. Food and Drug Administration. https://www.fda.gov/food/outbreaks-foodborne-illness/environmental-assessment-factors-potentially-contributing-contamination-romaine-lettuce-implicated.

U.S. Food and Drug Administration (2019). Investigation Summary: Factors Potentially Contributing to the Contamination of Romaine Lettuce Implicated in the Fall 2018 Multi-State Outbreak of E. coli O157:H7. U.S. Food and Drug Administration. https://www.fda.gov/food/outbreaks-foodborne-illness/investigation-summary-factors-potentially-contributing-contamination-romaine-lettuce-implicated-fall.

U.S. Food and Drug Administration (2020) Factors Potentially Contributing to the Contamination of Romaine Lettuce Implicated in the Three Outbreaks of E. coli O157:H7 During the Fall of 2019. U.S. Food and Drug Administration. https://www.fda.gov/food/outbreaks-foodborne-illness/factors-potentially-contributing-contamination-romaine-lettuce-implicated-three-outbreaks-e-coli.

U.S. Food and Drug Administration (2021a). Factors Potentially Contributing to the Contamination of Leafy Greens Implicated in the Fall 2020 Outbreak of E. coli O157:H7. U.S. Food and Drug Administration. https://www.fda.gov/food/outbreaks-foodborne-illness/factors-potentially-contributing-contamination-leafy-greens-implicated-fall-2020-outbreak-e-coli.

U.S. Food and Drug Administration (2021b). Investigative Report: Factors Potentially Contributing to the Contamination of Red Onions Implicated in the Summer 2020 Outbreak of Salmonella Newport. U.S. Food and Drug Administration. https://www.fda.gov/food/foodborne-pathogens/factors-potentially-contributing-contamination-red-onions-implicated-summer-2020-outbreak-salmonella.

U.S. Food and Drug Administration (2021c). Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption Relating to Agricultural Water. https://www.federalregister.gov/documents/2021/12/06/2021-26127/standards-for-the-growing-harvesting-packing-and-holding-of-produce-for-human-consumption-relating.

U.S. Food and Drug Administration (2022) Public Meetings on the Proposed Changes to Agricultural Water Requirements in the Produce Safety Rule. In: US Food Drug Adm. News Events CFSAN. https://www.fda.gov/food/workshops-meetings-webinars-food-and-dietary-supplements/public-meetings-proposed-changes-agricultural-water-requirements-produce-safety-rule-02142022.

Weller D, Brassill N, Rock C, et al (2020). Complex interactions between weather, and microbial and physicochemical water quality impact the likelihood of detecting foodborne pathogens in agricultural water. Front Microbiol 11:134. https://doi.org/10.3389/fmicb.2020.00134.

If you have difficulty acquiring access to any of the references listed within this document, please contact the grant coordinator, Christina Kessler, at christinakessler@ufl.edu.