National Water Reuse Action Plan
Completed Action

Action 3.5 Assess Specifications for Potential Reuse of Wastewater in Food Animal Protein Processing Facilities

Background

Animal protein processing operations include animal slaughtering, meat and poultry product production, and/or rendering of byproducts. These facilities use large volumes of water, totaling hundreds (to thousands for poultry) of gallons per thousand pounds live weight processed. Recognizing the high economic and environmental costs of both water use and wastewater discharges, these facilities are strong candidates for onsite water reuse, provided that potential health risks are appropriately managed. Water reuse can also help bolster operational resiliency at these facilities. However, specific treatment requirements for potable reuse of this unique source water have not been clearly defined.

The EPA and Tyson entered into a Cooperative Research and Development Agreement (CRADA) to establish a process for whole-facility protein processing wastewater reuse that maintains protection of food quality and consumer health. Specific project objectives included characterizing the microbial and chemical quality of protein processing wastewaters, determining the treatment requirements necessary to achieve public health benchmarks and identifing potential treatment train configurations to meet the treatment targets.

Action Team

Action Leaders

- **U.S. Environmental Protection Agency (EPA)**
  - Jay Garland (garland.jay@epa.gov)
  - Michael Jahne (jahne.michael@epa.gov)

Action Partners

- **Kansas Department of Health and Environment (KDHE)**
- **National Tyson Foods, Inc. (Tyson)**
- **Ohio Environmental Protection Agency (Ohio EPA)**
- **U.S. Department of Agriculture (USDA)**

Through this collaborative research effort, process wastewater samples reflecting different protein types, geographic locations, seasons, and processing configurations were collected from ten Tyson facilities. Samples were analyzed for a suite of microbial indicators and pathogen genes. With adequate estimates of pathogen densities in this particular source of water, quantitative microbial risk assessment (QMRA) was used to develop pathogen log reduction targets (LRTs) for onsite animal protein processing wastewater reuse and to define appropriate treatment train options for these operations.

Accomplishments/Impact

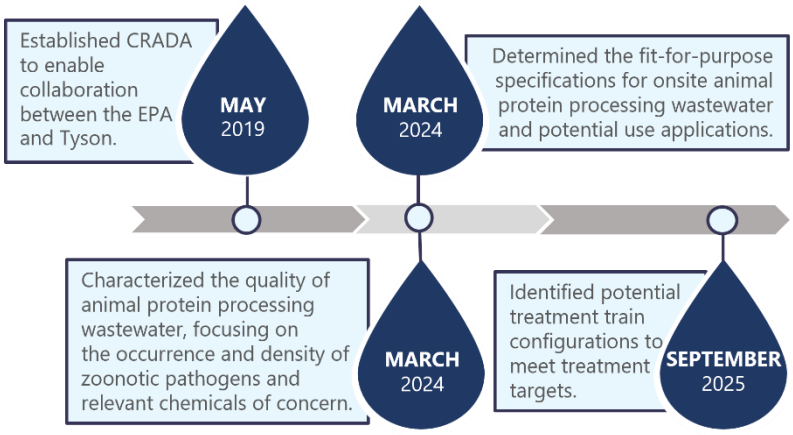
- Conducted sampling to characterize the quality of animal protein processing wastewater, focusing on the occurrence and density of zoonotic pathogens and relevant chemicals of concern.
- Determined the fit-for-purpose specifications for reuse within the processing facility.
- Presented the preliminary research, "Risk-Based Treatment Needs for Water Reuse in Protein Processing Facilities," at the 2024 WateReuse Symposium.
- Identified potential pilot treatment train configurations to meet treatment targets.
- Communicated all information directly to Tyson to inform implementation.
- Supported State regulatory agencies evaluating water reuse proposals from the industry.

Lessons Learned

Through this collaborative research effort, partners have developed an initial framework for managing risks during the multipurpose reuse of protein processing waters within these facilities based on findings from the following activities.

- Analyzed wastewater samples collected from Tyson facilities:
  - Microbial indicators (*Enterococcus* spp., total coliforms, and *Escherichia coli*) using culture-based method.
  - Pathogen genes (*Campylobacter* spp., *Salmonella enterica*, *Listeria monocytogenes*, *E. coli* O157:H7, *Cryptosporidium* spp., and *Giardia* spp.) using molecular methods.
- Used results to conduct QMRA to determine pathogen-specific LRTs that meet a risk target of 10^{-4} infections per person per year.
- Conducted a screening-level assessment of potential chemical contaminants (plant-use cleaning compounds, antibiotics and hormones) in the protein processing source waters to evaluate whether they would be adequately addressed by treatment processes necessary to achieve microbial targets.

Action Implementation Process



Potential Future Activity

In April 2026, the EPA announced that it was partnering with Tyson and USDA on WRAP Action 3.12 to pilot onsite recycling of protein processing water for additional food processing uses, with the goal of developing potable quality water and reducing its overall water footprint. The effort will build on findings from WRAP Action 3.5 to design and install a pilot treatment system at a selected plant and evaluate water quality and monitoring approaches to validate performance. Results will help inform regulatory pathways that enable Tyson and the broader protein-processing sector to expand safe, reliable water reuse through approved onsite treatment options.

Additional Resources

- 2019 Materials Cooperative Research and Development Agreement (MCRADA) between EPA and Tyson.
- WateReuse Symposium presentation, "Risk-Based Treatment Needs for Water Reuse in Protein Processing Facilities."