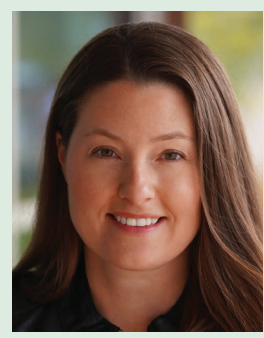


Development of a risk ranking tool for evaluating hazards and risks related to agricultural water Subpart E



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Summary

To enhance industry and regulatory confidence in making risk-based decisions on agricultural water and its use, our team is building a risk ranking tool, backed by quantitative microbial risk assessment (QMRA), that allows users to identify hazards and practices that increase potential risk as well as mitigation strategies that reduce risk applicable to their production system. This project aims to use historical laboratory and field data coupled with QMRA to quantify the impact of microbiological risk due to growing practices outlined by FDA in Subpart E. This effort to develop resources for industry will enable improved evaluation of risk posed by agricultural water use during production of covered produce, and provide scientific evidence to aid in risk reduction and support regulatory compliance.

Objectives

1. Identify and gather historical laboratory and field-based data on the presence and persistence of microbial pathogens and indicators in produce production systems, with a specific focus on agricultural production water under the context of Subpart E.
2. Using gathered data, develop a QMRA tool that will encompass probabilistic assessment of factors influencing pathogen survival and risk to produce.
3. Develop tailored case studies for agricultural water use that represent diverse growing conditions across the country. These case studies will allow for broader dissemination of the tool into the fresh produce community, offer a preliminary assessment of risk for the individual users, and provide a framework for the users to modify their scenarios as their existing/proposed production practices evolve over time.

Methods

We aim to bring together experts from produce growing regions across the country to evaluate hazards and relative risk with respect to language in Subpart E (Figure 1). The team is currently creating an interactive, web-based QMRA tool with risk using RStudio's freely available, web-based Shiny platform. The tool will aim to encompass QMRA and probabilistic assessment of factors influencing pathogen survival. This process allows for a quantification of the risks so that different intervention methods can be compared to achieve the desired risk goal. This tool could ultimately be used by anyone interested in characterizing risk in an agricultural production system but will specifically be tailored for industry and regulators to use to inform the development of risk-based assessment for the use of agricultural water.

Results to Date

The team has compiled historical data sets for the QMRA tool development (Figure 2). Also, we are using these data sets (and the apparent data gaps) to build a set of queries to be used during industry and subject matter expert (SME) interviews using the Delphi method (Figure 1). Initial assessments of published data demonstrate a dearth of information related to diverse environmental conditions and their impact on bacterial reduction as well as the potential impact of crop characteristics on pathogen susceptibility and survival. Additionally, the research team at Arizona State University has been working to develop the iRISK tool template using R shiny coding language. This template will be updated with datasets collected under objectives 1 and 2 and will be refined using stakeholder input as the project progresses.

Benefits to the Industry

This project will provide the produce industry with scientific data related to the cumulative benefits and tradeoffs of various agricultural water use practices on human health risk. Because so few QMRAs have been conducted on agricultural water taking into consideration production-specific information rather than relying on literature assumptions, we believe this information is critical to inform grower and regulator decision-making related to the use of agricultural water and informing decisions based on Subpart E. We will use collected data and assessments to inform industry of the impact of various water use scenarios on risk as outlined in Subpart E and potential ways to reduce risks based on real-world growing practices and mitigation measures.

Figure 1. Delphi Method (Dalkey & Helmer, 1963)

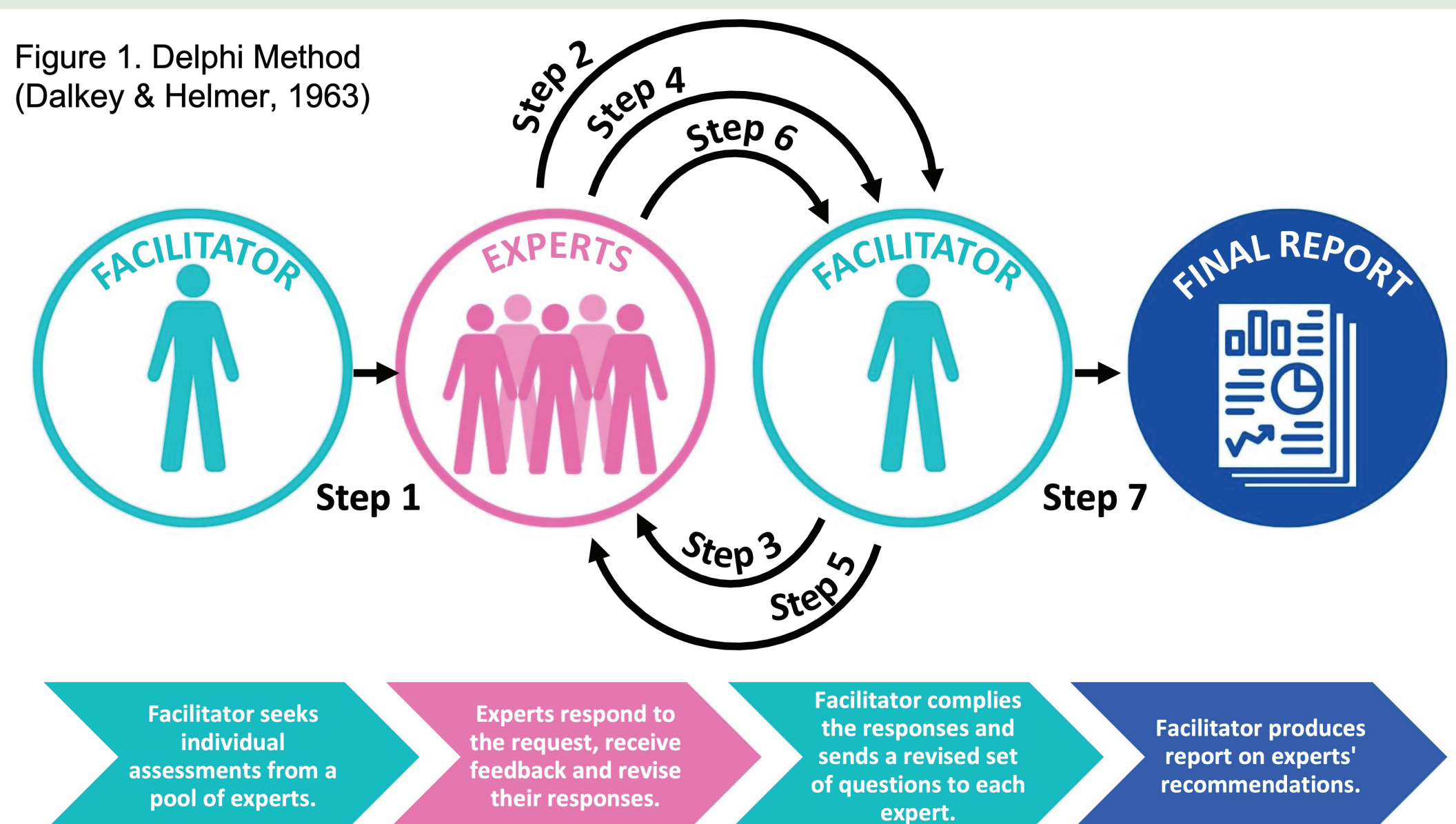


Figure 2. Proposed Machine Learning Model

