

# Evolution and survivability of foodborne pathogens in agricultural environments

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Recent FDA reports on *Escherichia coli* O157:H7 outbreaks involving fresh produce using WGS suggest that the same strain is responsible for numerous outbreaks over multiple year periods among different growing regions. This suggests that foodborne pathogens are persisting in the environment and moving among different environments, ultimately resulting in outbreaks. The project goal was to investigate the long-term persistence and evolution of *Salmonella*, *Listeria*, and *E. coli* O157:H7 in different agricultural environments. The study investigated evolution and survivability of the pathogens in irrigation water and agricultural soil kept under the temperature, humidity and average daily light for Yuma, AZ or Salinas, CA. Pathogens under Yuma, AZ conditions survived for less than two weeks during conditions corresponding to September through November, but started to survive at low levels for approximately two weeks during conditions corresponding to December through May. Under Salinas, CA conditions, *Salmonella* was culturable in soil until week 22 of the project, but only until week 16 in irrigation water. *Listeria monocytogenes* was culturable in soil until week 12, and was culturable in irrigation water until week 22. The results for *E. coli* O157:H7 were interesting; it became non-culturable by week 10 in soil, but spiked to low levels of culturable cells at weeks 22 and 26 before becoming non-culturable again at week 32. Whereas, there were culturable *E. coli* O157:H7 cells in irrigation water at week 16, non-culturable at week 22, and finally culturable at week 36. Overall, the current results indicate that under the low humidity and higher temperatures of Yuma, AZ the pathogens are either dying or entering the viable but non-culturable (VBNC) state in less than or approximately at two weeks, but the pathogens are remaining culturable for at least 10 weeks longer in the contrasting higher humidity and lower temperatures of Salinas, CA conditions.