

What We Need to Know

ON THE FARM

Sources/Reservoirs of *Salmonella*

- Are there environmental reservoirs for *Salmonella*?
- Are there domestic or wild animal reservoirs for *Salmonella*?
- Are there relevant human reservoirs for *Salmonella*?
- Are there specific seasons associated with contamination of tomatoes in the field?
- What is the prevalence of *Salmonella* in tomato seeds?
- How long can *Salmonella* persist in tomato fields? In plant waste? In irrigation water? In chemical sprays?
- Why are specific serotypes associated with tomatoes?
 - Is it because this reflects their presence in the environment or that they are host-adapted to infect or grow on/in tomatoes?
- Do certain varieties of tomatoes (or genetic traits) increase the risk of *Salmonella* fruit attachment or internalization?
- Are bodies of water in close proximity to tomato fields (ponds and canals) reservoirs for salmonella contamination of tomatoes?
- Other?

Vectors and Vehicles

- What vectors or vehicles are important in transmitting *Salmonella* from source to tomato plant or fruit?
 - Wild animals
 - Insects
 - Nematodes
 - Water
 - Airborne
 - Humans
 - Pesticide applications
 - Soil amendments
- Do soil organisms serve as means of maintaining or selecting for *Salmonella* in soil or water?
- Other?

Internalization

- What is the potential role of internalization of *Salmonella* in the tomato fruit?
 - Can *Salmonella* in seeds be taken up by seedling? How is this potential uptake affected by conditions of germination and seedling growth?
 - Are certain varieties more resistant to internalization?
 - Are there specific times when *Salmonella* can be taken up by the root system?

- Can “biting” insects inoculate the tomato plant or fruit with *Salmonella*?
- What is the practical significance of *Salmonella* inoculation via the flower?
- What is the increased risk due to cracking, splits, and other surface openings?
- At what stage is tomato plant most susceptible to internalization?
- If *Salmonella* is not internalized to any significant extent, how does it contaminate the surface of fruit? Does it “attach” to the fruit?
- If attachment is important, at what stage of development does it occur?
- Other?

Impact of Farm Practices

- Does the method of cultivation (e.g., stake, bush, black plastic) influence the potential for contamination?
- Does the method of irrigation influence the potential for contamination?
- Does the method of pesticide application influence the potential for contamination?
- Does the method of harvest influence the level of contamination?
- How do the conditions of post harvest wash influence contamination?
- Are the *Salmonella* strains associated with tomatoes match the *Salmonella* strains associated with farm workers?
- What food handling practices during harvesting contribute to risk of contamination?
- How amenable are current equipment to disinfection as a means of preventing the spread of contamination from one part of a farm to another?
- Can competitive exclusion concepts be applied to tomatoes?
- Does the rate of crop rotations influence the potential for contamination?
- Are current requirements for composting and/or pasteurization of animal manures sufficient to eliminate *Salmonella*?
- Does the plowing under of plant waste increase the survival of *Salmonella* in the environment?
- What adjacent land uses contribute to the potential for contamination?
- What measures can be taken to reduce or eliminate *Salmonella* colonization in agricultural soils or water?
- Are there methods to screen tomato fields for *Salmonella*?
- Other?

POST HARVEST

- What is the prevalence of *Salmonella* in tomatoes not subjected to factors that increase infiltration?
- What would be the prevalence with a “dry” processing system?
- Are there approaches for inactivating internalized or attached *Salmonella*?
- Are there specific post-market diseases that foster *Salmonella* post-harvest contamination or growth?

- What is the practical increase in risk of *Salmonella* contamination in chill injured tomatoes?
- What are the cooling and cold chain requirements that are needed to prevent the growth of *Salmonella* on tomatoes?
- Is the temperature in the ripening room high enough to encourage growth of *Salmonella*?
- Are there marketing practices that contribute to the growth of *Salmonella* on tomatoes?
- Where do cross contamination and multiplication occur during food processing and food service?
- Are there practical secondary barriers to prevent the growth *Salmonella* after slicing or dicing tomatoes?
- What is the prevalence of contamination in tomatoes as consumed?
- Other?