Transfer Potential of Salmonella Between Tomato Cartons and Tomatoes
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Introduction
Consumption of fresh tomato have been linked to large, multistate outbreaks, of salmonellosis (Lynch 2009). The most effective approach to reduce the risk of contamination when produced in consumed fresh, is to establish standards at each phase of crop management and post harvest handling.

A potential point of cross-contamination to tomatoes is during repacking operations. It is common practice in the industry to repack tomatoes into corrugated boxes from primary packinghouses. The risk of Salmonella contamination onto tomatoes from used cartons is not known. This information is needed to develop best practices for fresh tomato carton reuse.

Objectives
The objectives of this study were to determine Salmonella transfer coefficients (TC) between (i) inoculated new, used, and dirty cartons and tomatoes; and (ii) inoculated tomatoes and new, used, and dirty cartons, under varying inoculation conditions, contact times, and temperatures.

Materials and Methods
Salmonella Strains

Table 1: Salmonella Strains

<table>
<thead>
<tr>
<th>Strain</th>
<th>Source</th>
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<tr>
<td>Typhimurium</td>
<td>Harz 6</td>
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<tr>
<td>San Francisco</td>
<td>Salmonella typhimurium</td>
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Tomatoes
Mature green, round, washed and waxed tomatoes were purchased from a local supermarket.

575g of tomato (tunicary cap) was extracted, combined with 50g of sandy soil and mixed in a food processor for 3 min.

Cartons
New and single use cartons were obtained from local suppliers.

Cut into 3 cm x 5 cm squares

375 ml of tomato tunicary cap was extracted, combined with 50g of sandy soil and mixed in a food processor for 3 min.

Inoculation
Tomato or carton was spot inoculated with 100 μl of the 5 strain Salmonella cocktail containing 4 log CFU/strain.

The inoculum was allowed to dry for 0 (wet), 1, or 24 hours at ambient temperature.

Transfer
Transfer was evaluated in both directions.

Transfer to Cartons

Contacted Tomatoes/Cartons were subjected to three contact times of 0 (brush), 1 and 7 days and stored at two temperatures 12 and 25°C.

Calculations
- TC - Transfer Coefficient; P0 - population enumerated from the uninoculated surface (CFU/surface); P1 - population enumerated from inoculated surface (CFU/surface)

Table 2: Summary

Under all conditions tested, the transfer of Salmonella to/from tomatoes from used or dirty cartons was greater than or equal to that from new cartons.

The worst case for Salmonella transfer to new cartons is when cartons are dirty with short contact times.

The worst case for Salmonella transfer from used cartons is under wet conditions with a long contact time (0°C, 7 day contact, 25°C).

Conventional 1470 % transfer is 215 times higher than from a new carton.

The worst case for Salmonella transfer from dirty cartons is also under wet conditions (0, 1h-dry).

The influence of moisture demonstrates the importance of keeping cartons and tomatoes dry.

Inoculated Carton to Tomato

Results

Inoculated Tomato to Carton

References


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