Farm to Fork: Reducing the Risk of Microbial Contamination through Farmers’ Market Layouts

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National Count of Farmers Market Directory Listings

Source: USDA-AMS-Marketing Services Division
Farmers Market information is voluntary and self-reported to USDA-AMS-Marketing Services Division
Farm-to-Fork trend:

• Enhances local economy
• Attracts consumers and hospitality owners that value social responsibility
• Opportunity for growers to sell products directly to consumers

→ Products capable of transmitting foodborne pathogens if not produced and handled properly
Why is it such a risk now?

• Today’s farmers markets are more complex than ever
  – **Past**: whole fruits and vegetables = primary items
  – **Now**: food is processed, cut open to be displayed, samples to entice purchases, actual products sold... etc.

→ Increased complexity of product offerings = food safety has become a primary risk
A few risks:

- Standardized rules for maintaining food safety
- Inspections
- Environment
Environment

• Access to electricity
• Running water
  – Hand washing
  – Washing fresh produce
  – Dish washing (if needed)
Pathogens at farmers markets?

• The prevalence of pathogens at farmers markets has been documented and thoroughly researched (Bohaychuk et al., 2009; Li et al., 2017).

• Tested produce for thermotolerant *Campylobacter* and found that six different types of vegetables were positive at farmers markets, whereas those that were sampled at grocery stores tested negative (Park and Sanders, 1992)

• Tested samples of fresh herbs at farmers markets found that 24.1% tested positive for generic *E. coli* (Levy et al., 2015)
Research model

- Relationship between FM layouts and cross-contamination = not yet been explored
- Bandura’s Social Cognitive Theory’s Triadic Reciprocity Model (Bandura, 1978; 1986).
• **Research Question 1:** Can the environment influence consumers’ behaviors in order to reduce the risk of potential cross-contamination?

• **Research Question 2:** What commonly used farmers market layout is the most effective at reducing the risk of potential cross-contamination?
Methodology

- 3*2 experimental between-subjects factorial design (factors were: vendor booth configurations and set-up)
- Participants (n=54, 9 per layout)
- One gram of florescent compound (FC; GloGerm™) lotion was spread on the hands of each participant
Methodology (continued)

- The most common vendor booth configurations (L-shaped [L-S], U-shaped [U-S], and S-shaped [S-S] layouts) were investigated (TDA, 2017).

- Each market was designed with 2 different setups (A and B) that differed in how produce (P) and non-produce (N) booths were scattered.

- A total of 475 swab samples (25 swabs per layout) were processed and recorded for absorbance levels. The absorbance at 370 nm was measured using a DU 640 spectrophotometer (Beckman Coulter, Inc., Brea, CA).
Results

• Results showed that the simulated average level of CC of U-S market (0.874 g/mL) was significantly lower (p < 0.001) than L-S (2.321 g/ml) and S-S market (2.372 g/ml).
Results

- The best market layout and setup based on the average levels of FC (0.667g/ml) was the U-S market with A setup where produce and non-produce booths were scattered.
From Consumers to Chefs
FOOD SAFETY EDUCATION MATTERS
Recommendations/takeaways:

• If space allows, good to implement
• Note: Addition / extra precaution
Future research:

• Investigate reasons that CC level varies in FM - different layouts and designs

• Researchers may also consider different points of initial contamination:
  • Vendor hand contacts, fresh produce items, containers, and other factors in FM
• **Research Question 1:** Can the environment influence consumers’ behaviors in order to reduce the risk of potential cross-contamination? **Yes!**

• **Research Question 2:** What commonly used farmers market layout is the most effective at reducing the risk of potential cross-contamination? **U-S A set-up**
Thank you!

This research was supported by the National Institute of Food and Agriculture (NIFA) U.S. Department of Agriculture (USDA), under award number 20136800321288.