# Produce Safety and Biosecurity

## A Multi-State Research, Education, and Extension Initiative

Karen Simmons, University of Georgia

1785
The University of Georgia

# Objectives - Research

- Assess food defense plans for GAP certified and non-certified vegetable production farms in GA, SC and FL
- Assess food defense plans for fresh-cut produce operations in GA, SC and FL
- Evaluate retention of foodborne pathogens and bacterial toxins on fresh produce and evaluate intervention methods from a food defense standpoint

# Objectives - Education

- Incorporate college level course material linking food safety and defense against biological and chemical terrorism into existing courses on food safety and food laws at the undergraduate and graduate level
- Assess the impact of the new material in the courses

# Objectives - Extension

- Design, implement and evaluate workshops on food defense for fresh and fresh-cut produce management personnel
- Develop a curriculum package for use by County Extension Agents to teach workers about food defense Develop supplemental training material for the foodservice industry on food defense
- Develop computer module for use by teachers, health professionals and others to inform consumers of proper handling of produce suspected of intentional product tampering

# Status - Research

- *Clostridium botulinum* toxin stability assessed on the surface of fresh tomatoes, pre-cut lettuce and pre-sliced cantaloupe.
  - Toxin stability may vary based on type of produce, storage temperature and pH of toxin suspension
  - Temperature at which toxin is most stable –
    - Tomatoes – 25°C
    - Lettuce – 15°C
    - Cantaloupe – 4°C

- Endospore-forming *Bacillus atrophaeus* used as a surrogate for *B. anthracis* in studies designed to assess efficacy of moist heat treatments in reducing surface populations of spore-forming bacteria

- Endospore-forming *Bacillus atrophaeus* used as a surrogate for *B. anthracis* in studies designed to assess efficacy of moist heat treatments in reducing surface populations of spore-forming bacteria
  - Results indicate aqueous heat treatment is not a suitable method of reducing sporeforming bacterial populations from netted cantaloupe surfaces

# Status - Research

- Attachment to fresh produce and internalization potential of *E. coli* O157:H7 were examined
  - Attachment occurred more readily at ambient temperature (20°C) rather than refrigeration temperature (4°C)
  - Internalization did occur through stomata in lettuce and at sites of mechanical damage on carrots

# Status - Research

- Comparison of non-pathogenic strains of *E. coli* to *E. coli* O157:H7 to identify a strain that may serve as a surrogate in studies of attachment and recoverability from chilled produce
  - Cryotolerance, chlorine exposure survival and hydrophobicity examined with potential surrogates
  - *E. coli* ATCC 25922 exhibited similar traits, thus could be used as a surrogate

# Status - Education

- Fall 2005, undergraduate college course focused on defense of U.S. food supply
- Spring 2006, segment added to a combined undergraduate/graduate food law and regulations course featuring food defense plan development and a risk assessment exercise
- Spring 2006, similar segment added to a graduate level food toxicology class

# Status - Outreach

- Developed survey form to use in evaluation of food defense in the produce industry
- Conducted on-site food defense auditing of both fresh whole produce and minimally processed (fresh-cut) produce operations
- Developed and incorporated one-half day trainings on food defense for the produce industry into existing GAP and HACCP training programs

# Status - Outreach

- Designed and implemented a “train the trainer” workshop to educate Extension personnel in food defense plan development
- In-service training programs held in the three project states
- Food defense practices presented at industry meetings in GA, FL and SC
- Consumer bulletin and other printed material prepared on the safe handling of produce

# Impact

- Food defense plan segment in GAP and HACCP workshops was well received in ‘05 and has been repeated in ’06.
- Undergrads in college course indicated increased awareness of food defense issues.
- Botulinum toxin was stable with some variations depending on factors such as pH of toxin and storage temperature.
- Successfully used surrogates for *Bacillus anthracis* and *E. coli* O157:H7 in challenge studies.
- Identification of security vulnerabilities in packing and processing facilities has contributed to improvements at some facilities.

# To be completed

- Completion of non-pathogenic *E. coli* surrogate studies on attachment and recoverability from chilled produce.
- Development of computer module and other material dealing with consumer handling of produce
- Development of food defense training CD for use by workers in the fresh produce industry
- Continuing food defense workshops and trainings for industry and extension personnel

# Acknowledgements


- This material is based on work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under special project number 2002-10688-3 and by the GA Agricultural Experiment Station.
- Co-investigators –

*from UGA:*

- Mark A. Harrison
- William C. Hurst
- Judy A. Harrison
- Karen W. Simmons

*from UFL:*

- Keith R. Schneider
- Amy Simonne
- Jeffrey Brecht

*from Clemson University:*

- James W. Rushing


1785
The University of Georgia