

# Emerging Microbial Challenges in Retail and Food Service Settings

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UNIVERSITY of **HOUSTON**

CONRAD N. HILTON COLLEGE

# Outline

- About me
- Case studies
- Findings from the University of Houston
- Moving forward



# About me

UNIVERSITY of **HOUSTON**  
CONRAD N. HILTON COLLEGE



Bachelors in Life  
Sciences, Mumbai, India

Masters in Life Sciences,  
Mumbai, India

Masters in Biotechnology,  
Texas A&M University

Doctorate in Poultry  
Science, University of  
Arkansas

Research Assistant  
Professor, Food Safety,  
University of Houston

Assistant Professor,  
Food Safety, University  
of Houston

Clinical labs

Academic and clinical labs

Student worker for vet school and **food safety lab**

*Salmonella* pathogenesis

Produce safety, farmers market food safety, retail  
food safety

Molecular food safety



- Food with integrity
- Local
- Sustainable
- Antibiotic-free
- No GMO's



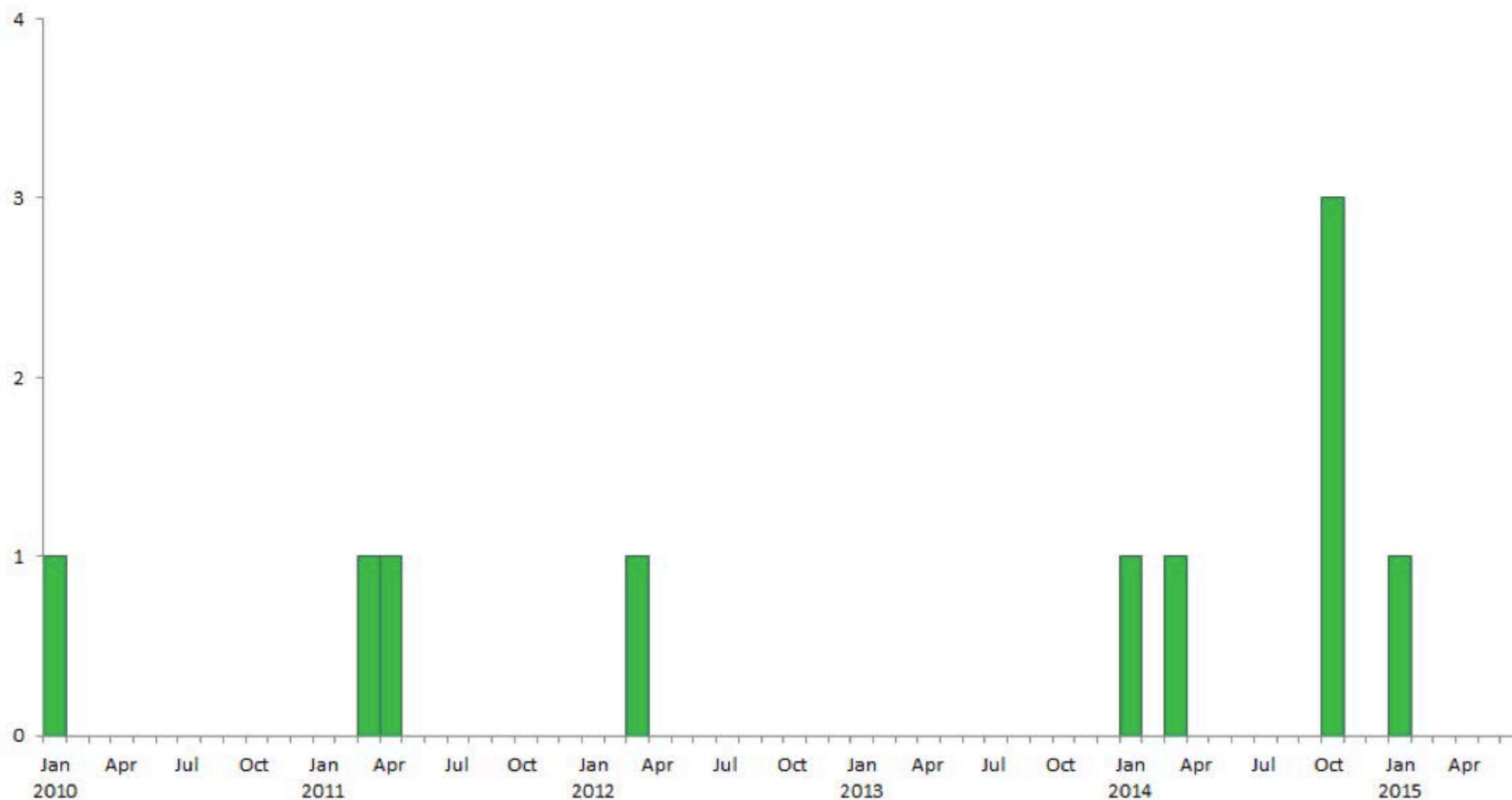


Time	Location	Pathogen	# of Illnesses	Source
JULY 2015	Seattle	<i>E. coli</i> O157:H7	5 sick	?
AUGUST 2015	Simi Valley, CA	Norovirus	234 sick	Sick employee
SEPTEMEBER 2015	Minnesota	<i>Salmonella</i> Newport	64 sick	Tomatoes?
OCTOBER 2015	11 states	<i>E. coli</i> O26	55 sick	?
DECEMBER 2015	3 states	<i>E. coli</i> O26	5 sick	?
DECEMBER 2015	Boston, MA	Norovirus	151 sick	Sick employee
<b><i>TOTAL= 514 Illnesses</i></b>				





People infected with the outbreak strains of *Listeria monocytogenes*, by month of illness onset\*



Month of Illness Onset

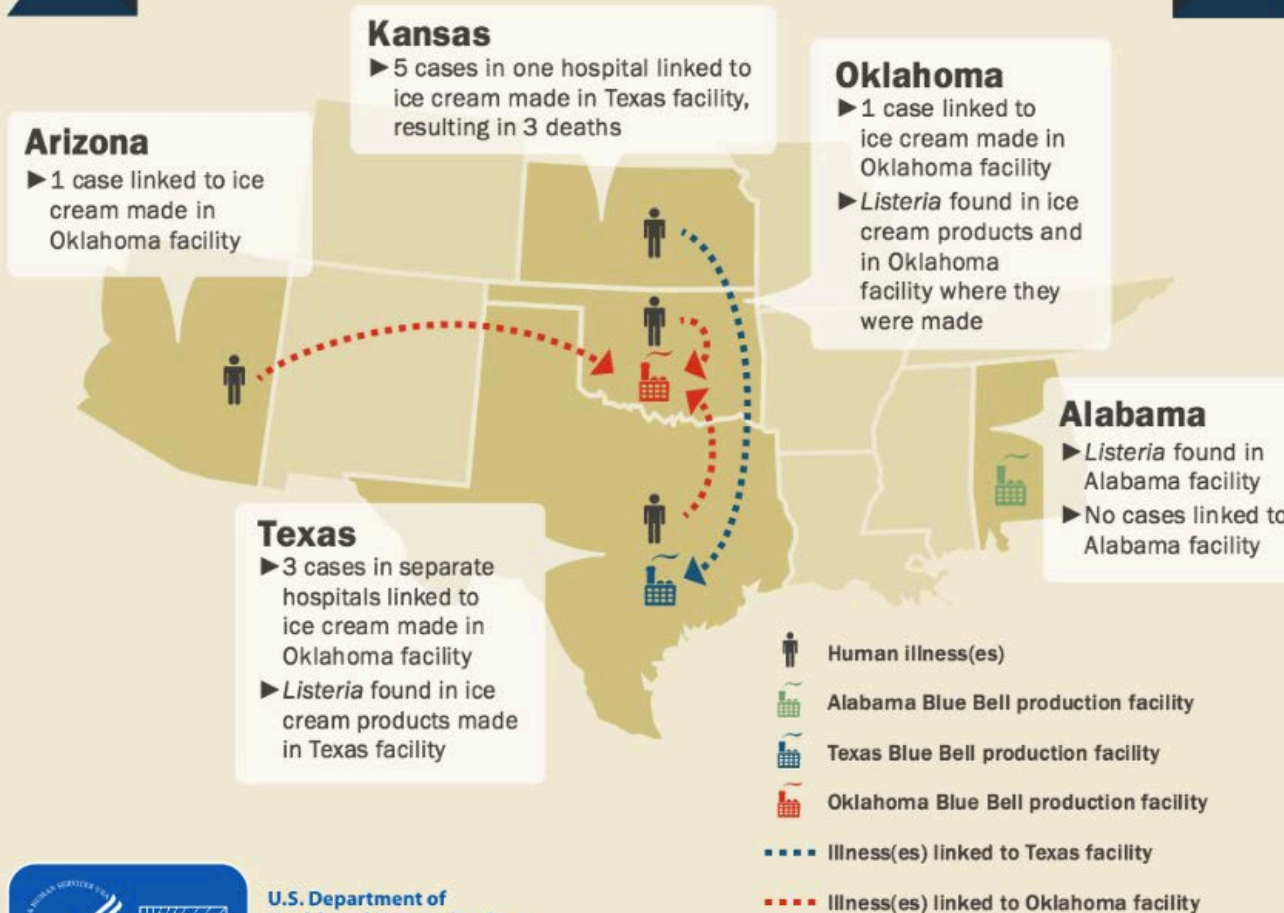




# LISTERIA AND BLUE BELL ICE CREAM

Contaminated production facilities and illnesses linked to Blue Bell Creameries

**CDC recommends that people not eat, serve, or sell any recalled Blue Bell brand products. This complicated investigation of a listeriosis outbreak involved serious illnesses from 2010 through 2015 linked to two Blue Bell production facilities.**



U.S. Department of  
Health and Human Services  
Centers for Disease  
Control and Prevention

Learn more: [www.cdc.gov/listeria/bluebell](http://www.cdc.gov/listeria/bluebell)

# Blue Bell Inspection Reports From 2007-2014

- Plant cleanliness issues
- Condensation on steel pipe dripping onto an ice cream sandwich wafer
- Condensation dripping into empty cartons
- Worker hygiene— not using gloves , not washing hands after touching hair and cap



**Findings at UH**

**A. Retail Deli  
Project**

**B. Retail  
Leafy Green  
Project**

# Retail deli research project





## Retail delis

- Contaminated deli meats are responsible for 90% of listeriosis cases
- Deli meats sliced at retail have a higher incidence (83%) of *Listeria*



Overarching goal of this study was to study cross-contamination patterns and identify hot spots in retail delis

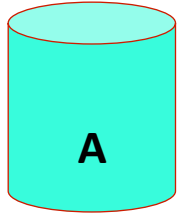
- Track cross-contamination in a mock retail deli using a fluorescent compound (FC; Glo Germ<sup>®</sup>)
- Glo Germ<sup>®</sup> simulates bacterial cross-contamination and sanitary practices and fluoresces under black light



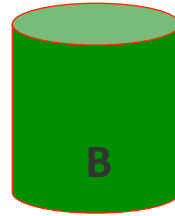
Source: [www.hlntv.com](http://www.hlntv.com)

# Methodology

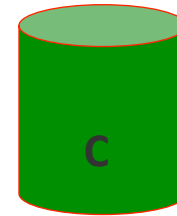
FC= Glo Germ<sup>®</sup>



Bologna sample A  
inoculated with FC



Bologna sample B  
not inoculated  
with FC



Bologna sample C  
not inoculated  
with FC

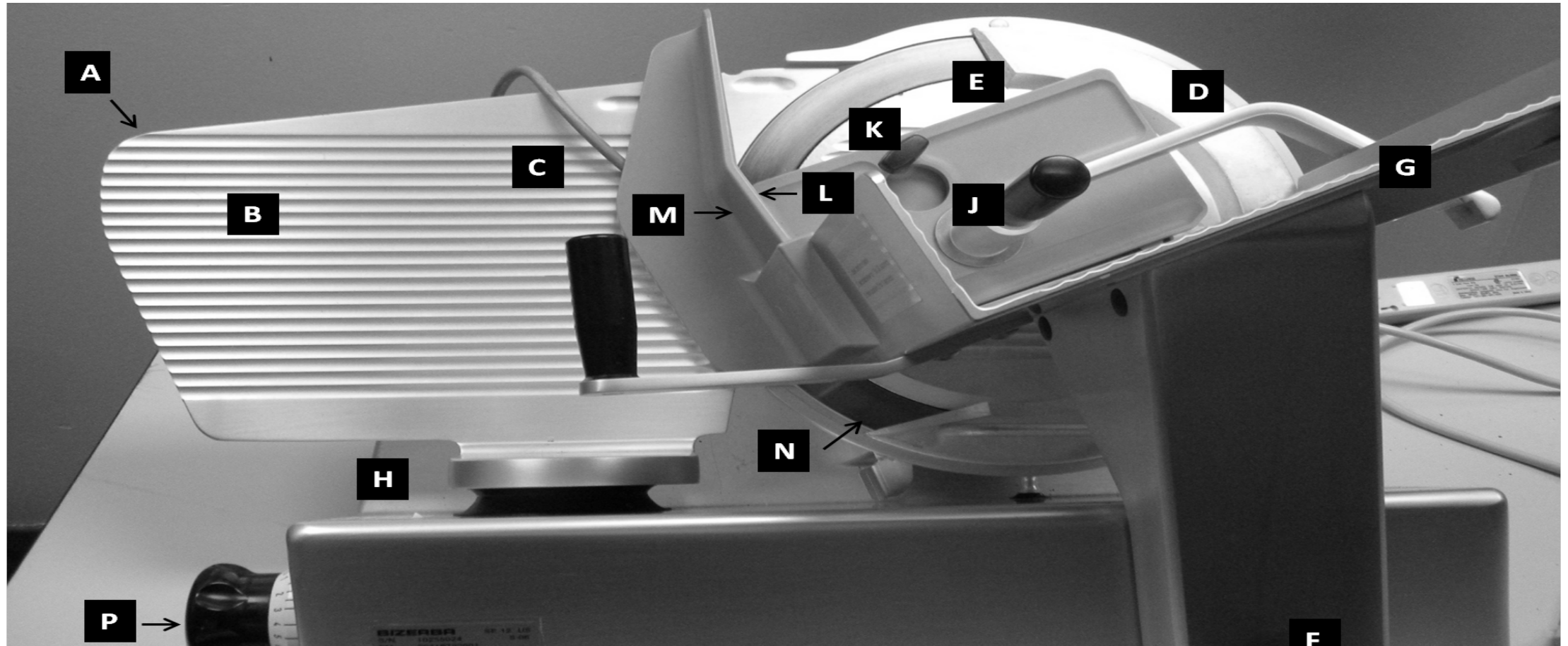


Volunteers (50 students recruited; simulate retail employees) given specific instructions on how to slice bologna using a deli slicer



Walk to refrigerator, remove sample A, turn on the deli slicer, slice the meat on deli paper, wrap the meat and place it back in the deli cooler. Repeat the process with B and C.

# Methodology



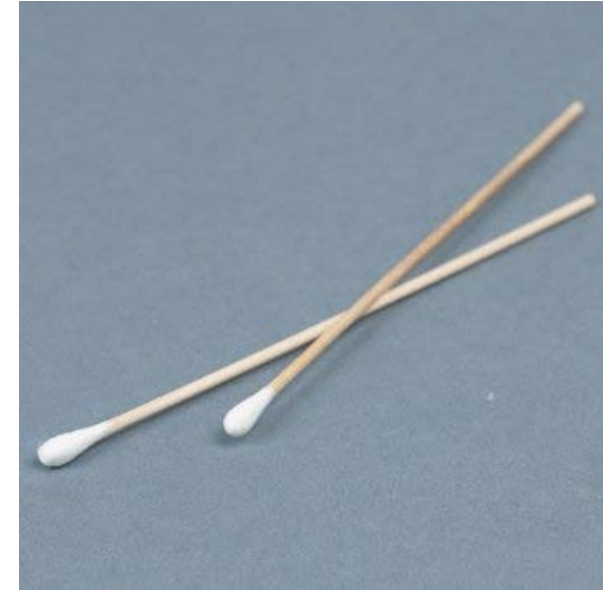


# Methodology

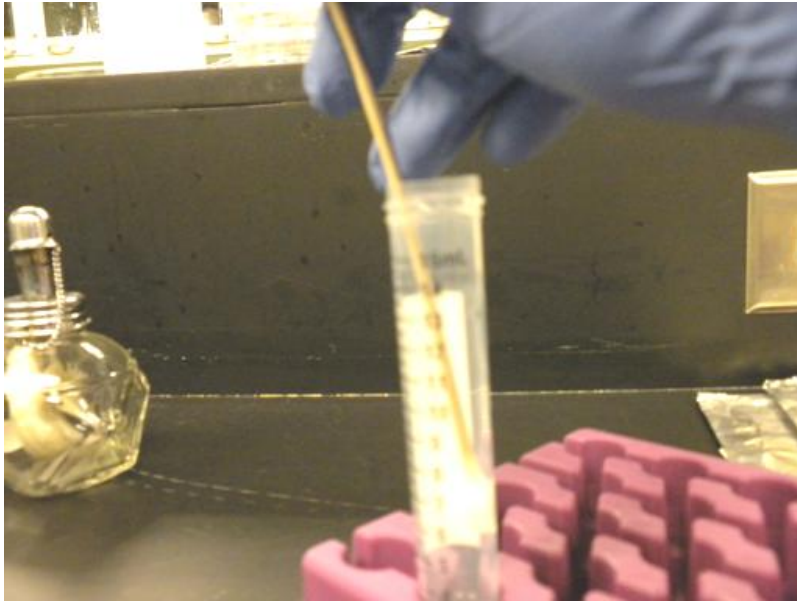
After each volunteer completed the slicing process, sterile aluminum templates were used to swab a 5 cm<sup>2</sup> areas on various parts of the deli slicer and kitchen environment



The swabs were placed in tubes containing alcohol



# Methodology



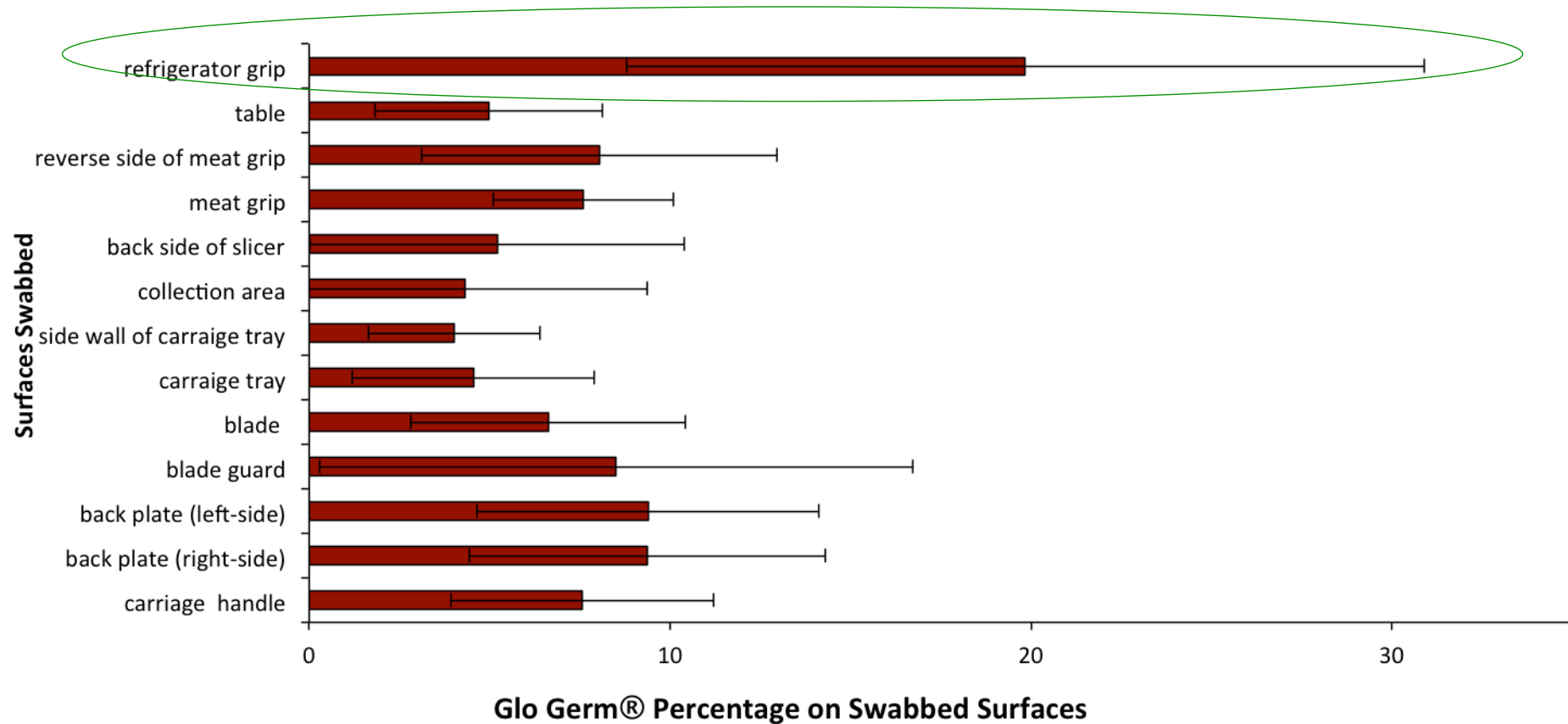
FC amount was quantified using a spectrophotometer

# Methodology



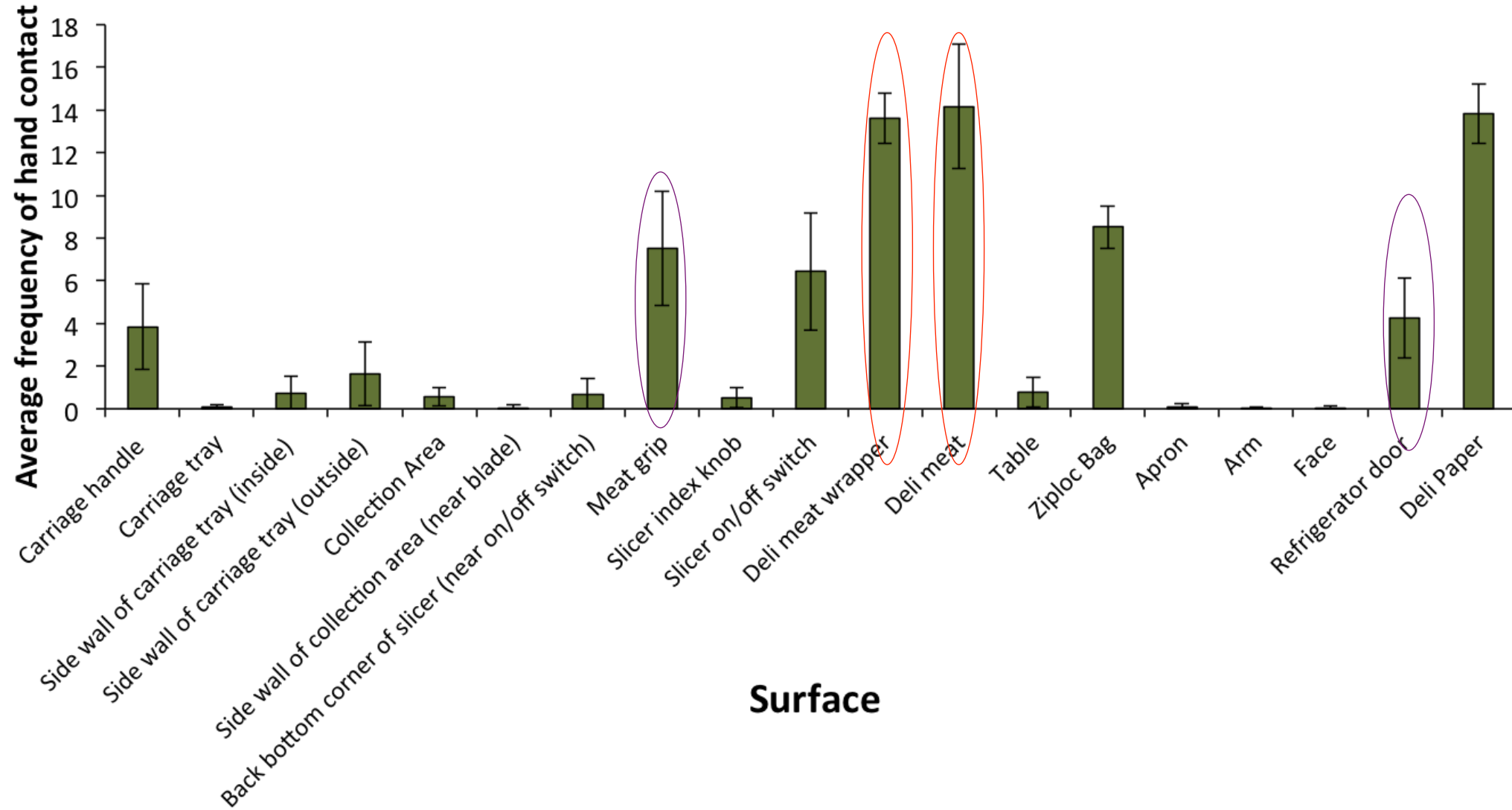
The actions of 50 volunteers was recorded using flip video cameras– the hand contact frequencies were analyzed by 4 independent researchers

# Results- % FC/Glo Germ® on surfaces





# Results- Frequency of hand contact on surfaces





**Findings at UH**

**A. Retail Deli  
Project**

**B. Retail  
Leafy Green  
Project**

# Fresh and fresh-cut produce in retail



Source: [www.aipt.edu.au](http://www.aipt.edu.au)



CBS/AP / August 20, 2012, 2:17 PM

# E.coli fears prompt romaine lettuce recall



romaine lettuce recall generic / AP

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HEALTH JUL 16 2014, 3:57 PM ET

## Applebee's Pulls Salad After Minnesota E. Coli Cases

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### E. Coli Outbreak Linked to Salads Declared Over With 33 Sick

BY NEWS DESK | DECEMBER 12, 2013

The outbreak of E. coli O157:H7 linked to ready-to-eat salad products produced by Glass Onion Catering and sold at Trader Joe's has ended, according to the U.S. Centers for Disease Control and Prevention.

At least 33 people in four states fell ill, with seven hospitalized. Two patients developed hemolytic uremic syndrome (HUS), a kidney disease associated with severe E. coli outbreaks.

The case count by state ended as follows: Arizona (1 illness), California (28), Texas (1) and Washington (3).

Only one new illness had been detected since the last outbreak update on Nov. 21.





# What did we do?

## OBSERVATION

- 16 restaurants and 16 grocery stores recruited
- Conducted observational assessments to identify trouble-spots

## KNOWLEDGE

- Manager and employee knowledge assessment

## BEHAVIOR

- Behavioral modelling based on observational study

## TRAINING

- ONGOING

# Observational Study

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## Questions

## Responses (n = 110)

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**Temperatures are taken every 4 hours**

**Yes**

51.6%

**No**

45.2%

**Calibrated thermometers are used to check temperatures**

**Yes**

58.1%

**No**

41.9%

**Employees observed washing hands**

**Yes**

45.2%

**No**

41.9%

**Employees properly wash hands prior to starting preparation or putting on gloves.**

**Yes**

58.1%

**No**

38.7%

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# Knowledge assessment

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## Questions

## Responses (n = 110)

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**To properly wash your hands, you should make sure to wash and scrub at least 20 seconds.**

**Answered  
correctly**

54%

**Answered  
incorrectly**

46%

**The number one contributing factor leading to foodborne illness in retail food establishments is improper holding temperatures of foods.**

**Answered  
correctly**

57%

**Answered  
incorrectly**

43%

**Temperatures in refrigerated storage should be measured daily with the thermometer placed in the part of the unit that is warmest.**

**Answered  
correctly**

53%

**Answered  
incorrectly**

47%

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# Scenario 1: Cross contamination involving equipment (salad spinner and cutting board)



Lettuce A: CONTAMINATED



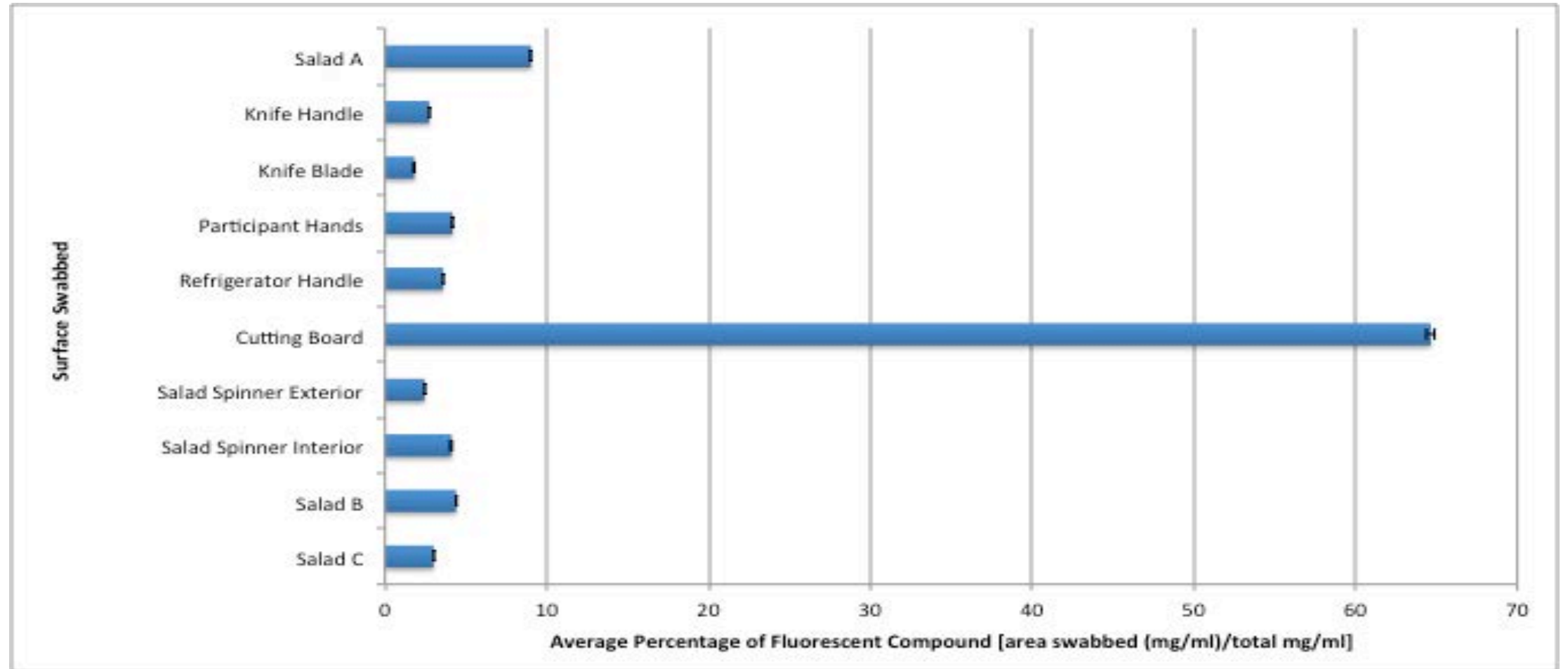
Lettuce B: NOT CONTAMINATED



Lettuce C: NOT CONTAMINATED

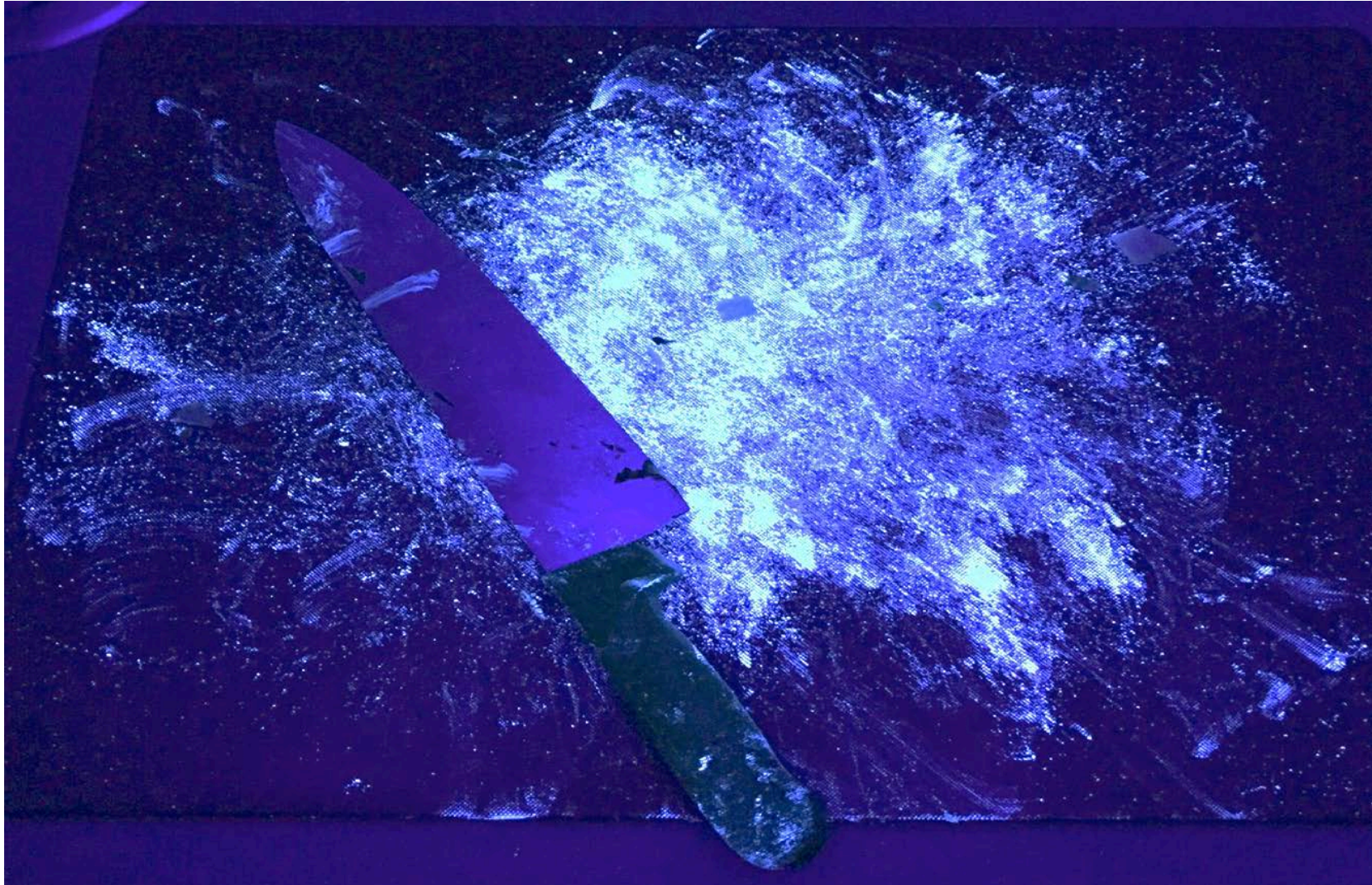
1. Slice lettuce A on a cutting board
2. Submerge and spin in salad spinner
3. Place in bowl
4. Repeat process with lettuce B and C

# Results





# Results



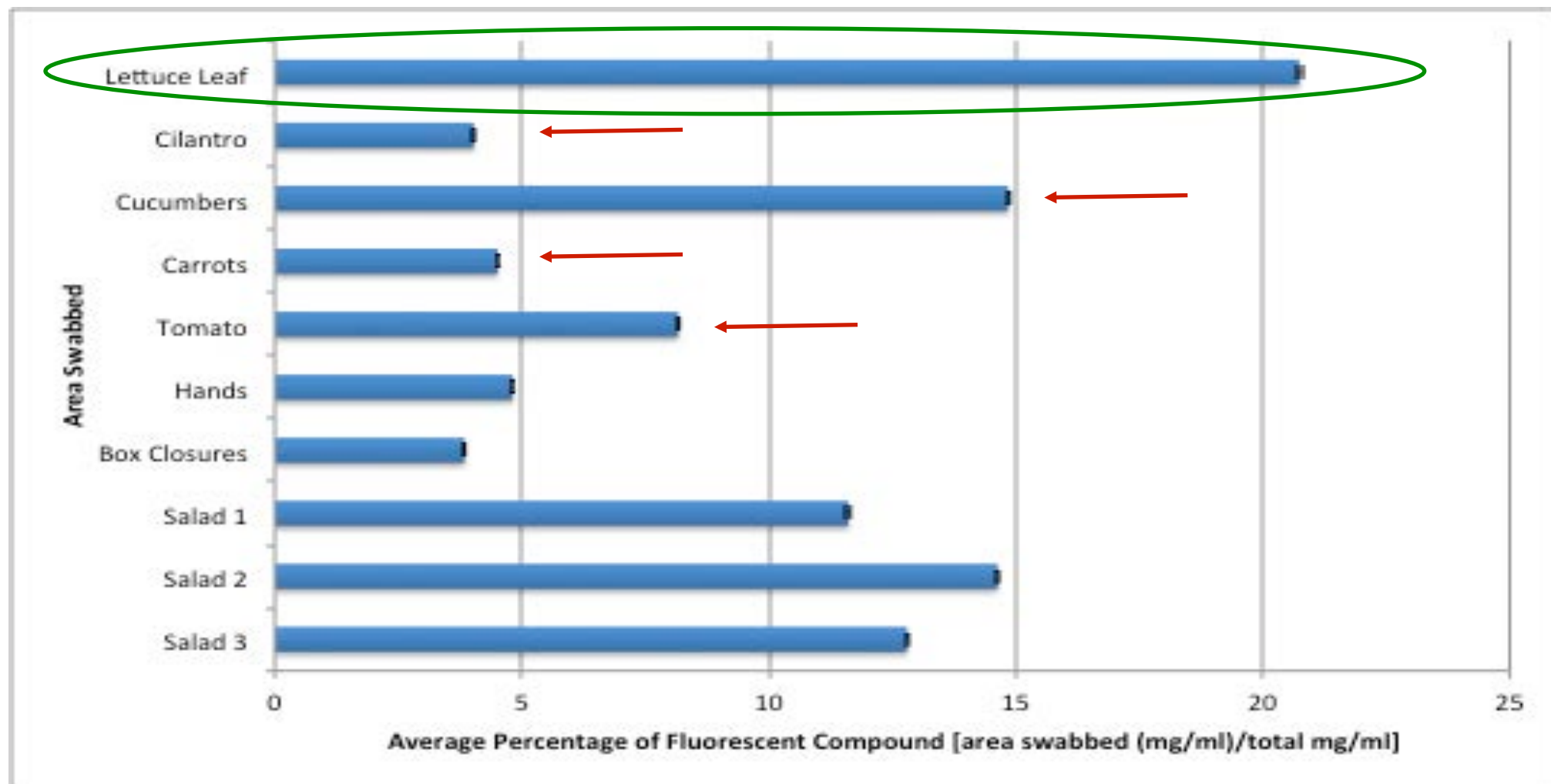


## Scenario 2: Preparing salad with pre-washed leafy greens



1. Grab greens and place 1 handful in each of the 3 plastic containers
2. Make 3 salads with: lettuce, 2 cherry tomatoes, a sprinkle of shredded carrots, 2 cucumbers, a sprig of cilantro
3. Close containers

# Results



# Results

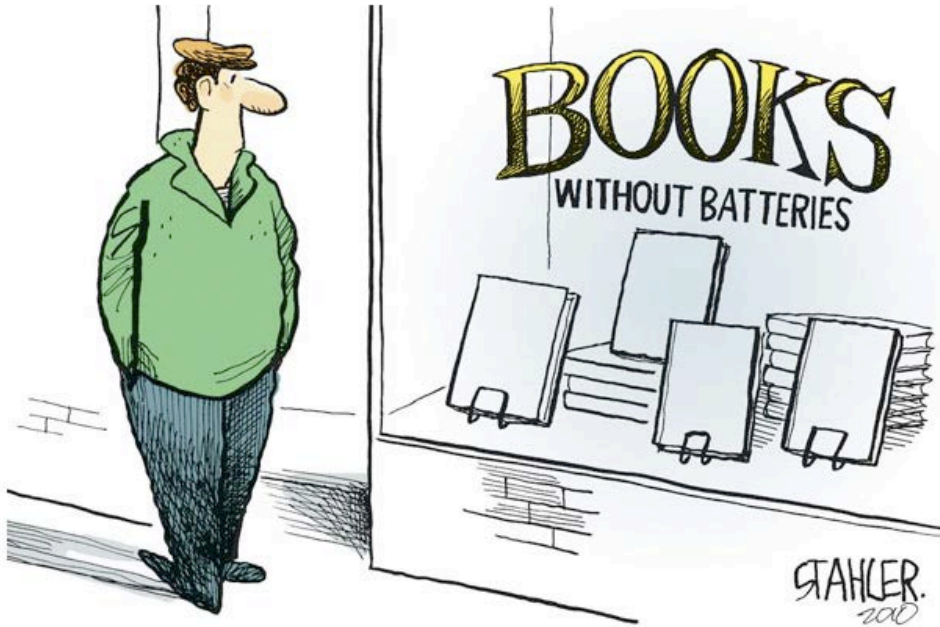


# Ongoing work

- Specific behavior-based training
- Return to grocery stores and restaurants to measure the efficacy of the educational material



# Moving forward



- FSMA– proactive rather than reactive
- Be prepared for the worst and work (and hope for) towards the best
- Training
- Working with third party auditing company

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*Thank  
You*

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