INTEGRATING RESEARCH AND EXTENSION FOR IMPROVED FOOD SAFETY IN MASSACHUSETTS

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UMASS AMHERST

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Food Science Program

Extension

- MA Food Policy Council
- Adult Education
- Technical Guidance
- Youth Outreach

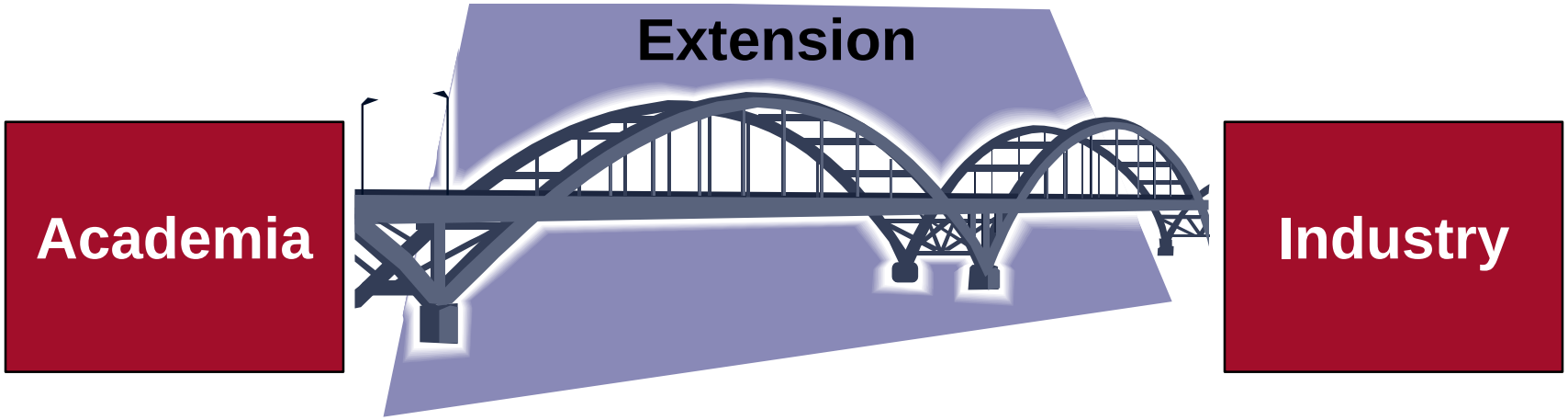
Research

- Food Safety
- Food Product Development
- Health & Wellness

Teaching

- Introduction to Food Science
- Product Development Seminar

Goal of Food Science Extension



***Goal:* Build a stronger bridge between Academia and the Food Industry**

UMass Food Science Programming

- **Preventive Controls**
- **Hazard Analysis of Critical Control Points**
- **Produce Safety**
- **Better Process Control School**
- **Product Development**
- **Food Science Short Courses (Emulsion, SERS, Lipid Oxidation)**

Food Safety Modernization Act (FSMA)

- Most sweeping reform of food safety in US since 1937 Food, Drug and Cosmetic Act.
- Seven Rules
  - Produce Safety Rule
  - Preventive Controls for Human Food
  - Foreign Supplier Verification Programs
  - Accreditation of Third-party Auditors for Foreign Facilities
  - Preventive Controls for Animal Food
  - Mitigation for Intentional Adulteration
  - Sanitary Transportation of Human and Animal Food

UMass FSMA Focus

- Produce Safety Rule (PSR)

- Preventive Controls for Human Food Rule (PCHF)

PRODUCE SAFETY

On-Farm Food Safety

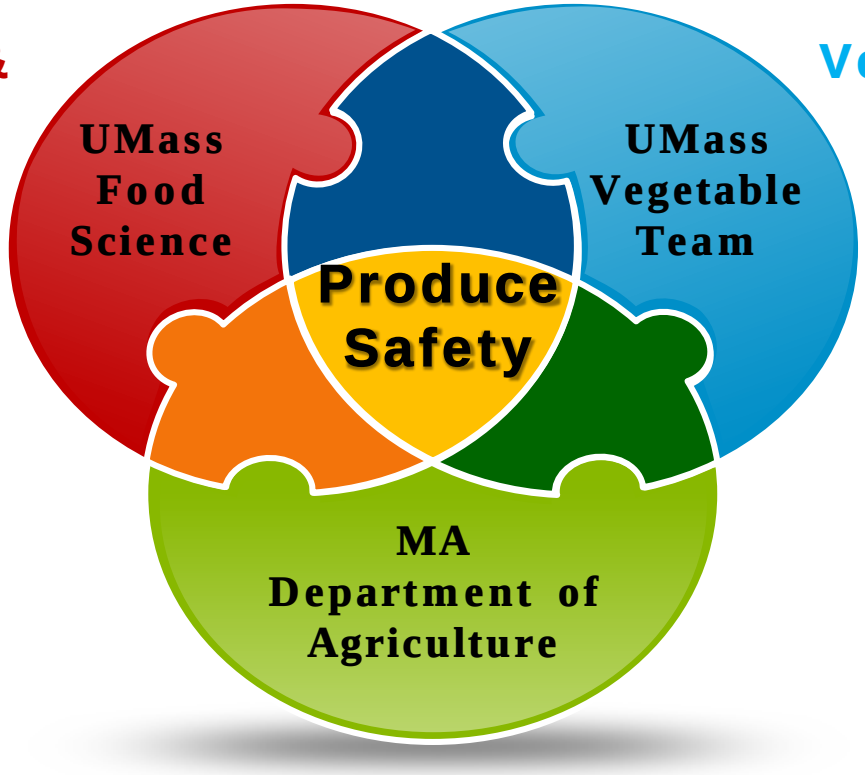
FDA FOOD SAFETY MODERNIZATION ACT

Produce Rule

'At least one supervisor or responsible party for your farm must have successfully completed ***food safety training*** *at least equivalent to that received under standardized curriculum recognized as adequate by the Food and Drug Administration.'*

MA Approach on Produce Safety

Food Science & Safety
Amanda Kinchla



Vegetable Program
Lisa McKeag

Department of Agriculture
Michael Botelho

Postharvest Equipment

CFR 112.123 Equipment, Tools, Buildings, and Sanitation – Subpart L

- Appropriate measures are taken to use equipment and tools that are of adequate design and construction to enable ***adequate cleaning*** and maintenance and prevent contamination of covered produce and food contact surfaces
  - Appropriate storage
  - Maintenance and cleaning of equipment
  - Tools
  - Instruments (including transport equipment)
  - Building structures.

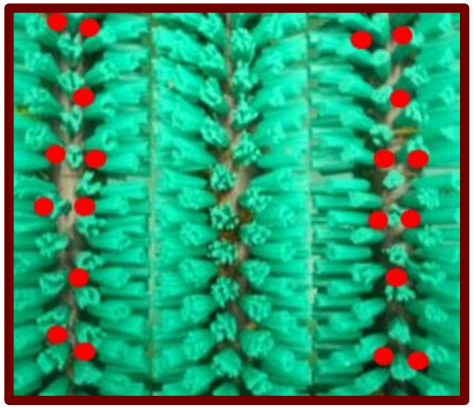
https://www.fda.gov/downloads/food/guidanceregulation/guidancedocumentsregulatoryinformation/ucm574456.pdf

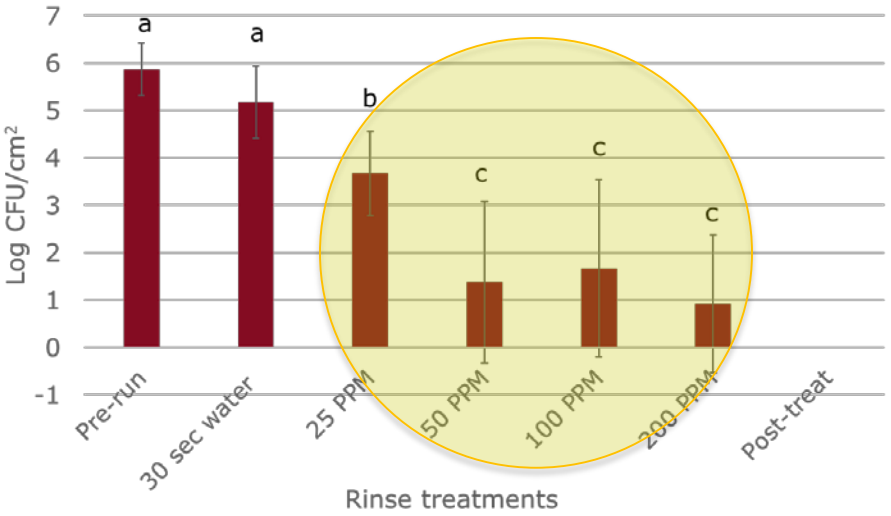
Challenges - Postharvest Equipment

- Existing equipment is challenging to clean
  - Wood
  - Non-removable parts
- Limited available alternatives
- Cost of new infrastructure
- Limited guidance

Adopted from PSA: Water Summit Webinar

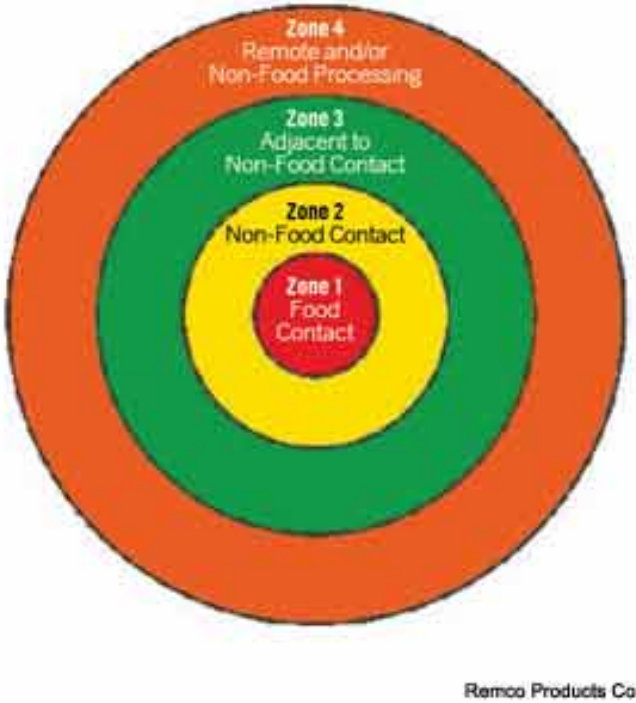
Research Approaches to Improve Postharvest Sanitation





- Water alone is not an effective way to remove significant numbers of bacteria from brush rollers as the bacterial loads after 300 seconds of washing were not significantly different.
- Chlorine treatments as low as **25ppm after a 30 second water rinse** provides a significant reduction in microbial load.

Research Approaches to Improve Postharvest Sanitation



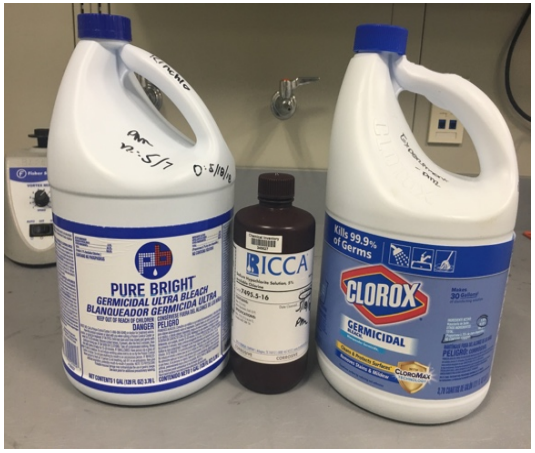
http://www.foodqualityandsafety.com/wp-content/uploads/springboard/image/FQ_FebMar_2014_pp48_01.jpg

https://i.ytimg.com/vi/qWozF4uuBqo/hqdefault.jpg

https://www.aibonline.org/aibOnline_/www.aibonline.org/newsletter/Magazine/Nov_Dec2013/EPMEarlyWarningHazards.pdf

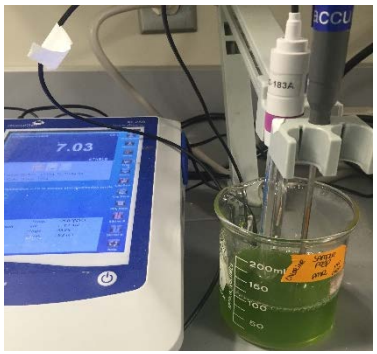
http://www.gemscientific.co.uk/product/3m-petrifilm-coliform-count-plates/

Postharvest Produce Washing



Carbon Oxygen Demand (mg/L)

Turbidity (NTU)



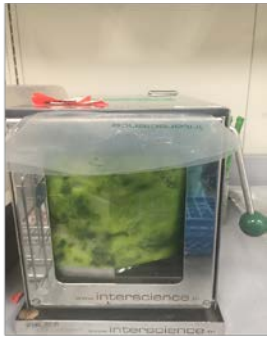
pH

Oxygen Redox Potential (mv)

Pathogen survival

Monitoring Produce Washing

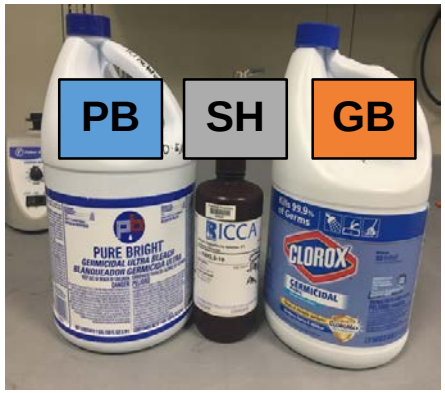
Blender
Complete Homogenization



Stomacher
Paddle Mixing

Titrations:

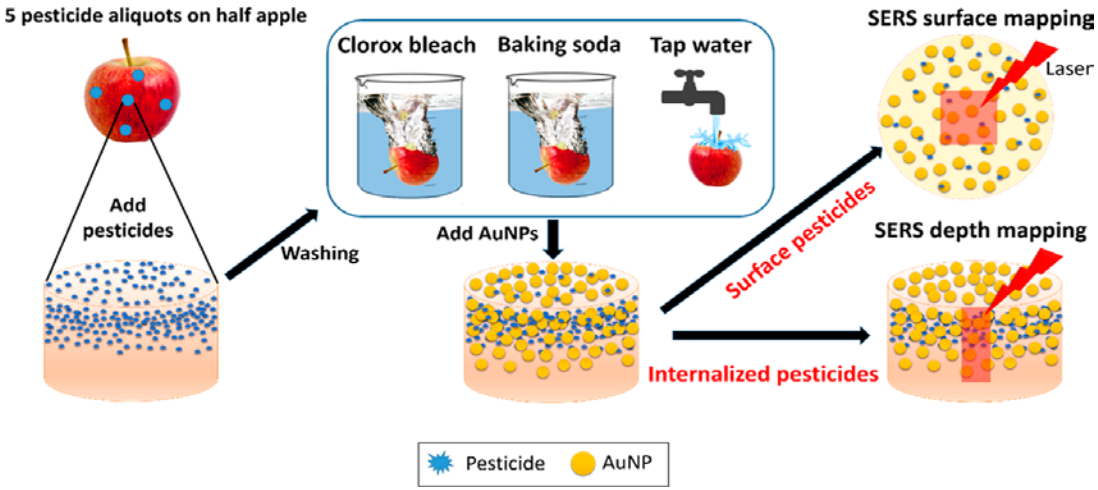
1. **DPD** (N, N-diethyl-p-phenylenediamine)
2. **IOD** (Iodometric)



- Method for preparing process water impacts physicochemical characteristics
- Different analytical methods influence the Cl response
- Commercial brands of chlorine had different responses to reducing microbial loads.

Effectiveness of three washing agents in removing pesticide residues

Dr. Lili He
Surface Enhanced Raman Spectroscopy
UMass Food Science



We used a unique technique called SERS mapping to study the surface and internalized pesticides, respectively.

1. baking soda is the most effective in removing the two pesticide residues applied on apple surfaces

2. the concertation of baking soda used in this study is equal to 1 teaspoon in 2 cup of water

3. it takes 12-15 min for completely removing surface pesticides at the level of 125 ng/cm^2 (below MRL-max residue limit)

4. penetrated internal pesticide is difficult to remove by washing

FOOD PROCESSING

Food Safety Regulation: Processing (wholesale)

Challenges - Preventive Controls Rule

- Validation justification
  - Technical competency
  - Scientific availability
- Resources
  - FDA PC Guidance
  - TAN
- Uncertainty of compliance
  - State
  - Processor
- Awareness
- Capacity challenges
- Liability & accountability

http://foodsafety.merieuxnutrisciences.com/wp-content/uploads/2017/04/shutterstock_566689867.jpg

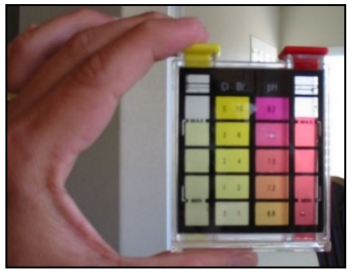
Food Safety Management Training for Small and Emerging Food Businesses: Integrating a Food Safety Culture from Concept to Commercialization

Problem Statement / Issue Definition:

- The development of shared-use processing facilities - challenged with regulation and food safety compliance.
- Increase feasibility of locally and regionally produced agricultural products
- Provide a focused educational delivery SEFM - understand critical food safety considerations from concept to commercialization.

Approach / Methods:

- Conduct a needs assessment
- Develop a curriculum and online training tools, field a pilot test and evaluate
- Implement a sustainable food safety program



Results / Outcomes:

- sustainable food safety program, for small and emerging food businesses.
- Includes online tools, a food safety educational program, and a “train the trainer” curriculum to provide technical support for the northeast region.

Processing Value-Added Acidified Shelf-Stable Foods

1. Establish conditions for thermal processing (hermetically sealed containers)
   - 108.25: acidified
   - 108.35: low-acid
2. Process Authority Review
3. All processors* shall register with the FDA
4. All operators of thermal processing products must attend a training approved by FDA Commissioner

UMass – Product Development

- Establish FDA approved scheduled processes for acidified shelf-stable foods to increase usage of specialty crops
- 12 science based, minimally processed value-added products (acidified shelf-stable products)
- Goal - increase the production of specialty crops through value-added processing



UMass – Product Development

Product	Size	Scheduled Process	Standard Operating Procedure	Production Ready
Bread and Butter Pickles	8 oz. / 16 oz	Yes	Yes	Yes
Pickled Beets	8 oz. / 16 oz.	Yes	Yes	Yes
Pickled Turnips	8 oz./ 16 oz.	Yes	Yes	Yes
Pickled Radishes	8 oz./ 16 oz.	Yes	Yes	Yes
Diced Tomatoes	16 oz. /32 oz.	Yes	Yes	Yes
Zucchini Pickles	16 oz.	Yes	Yes	Yes
Blueberry Jam	8 oz.	Yes	Yes	In Process
Apple Butter	8 oz.	Yes	Yes	Yes
Pickled Dill Beans	8 oz.	Yes	Yes	Yes
Red Hot Sauce	8 oz.	Yes	Yes	Yes
Dill Relish	8 oz.	Yes	Yes	Yes
Pickled Carrots	8 oz.	No	In Process	No

Integrating Research and Extension for Improved Food Safety

- Applied Research
- Trainings – Certifications
  - Produce Safety Alliance
  - Preventive Control for Human Food
- Improving Networks to Maximize Impact
  - Regional Centers
  - Northeast = NECAFS, lead by UVM and UMass, Penn State, Cornell and UMD
  - Clearinghouse

UMass Extension

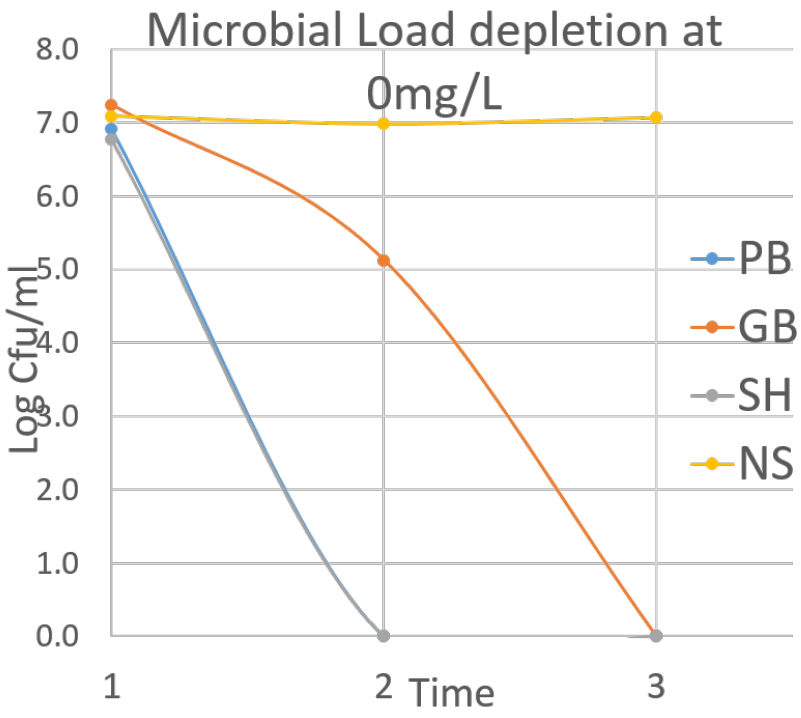
FSPCA
FOOD SAFETY PREVENTIVE CONTROLS ALLIANCE

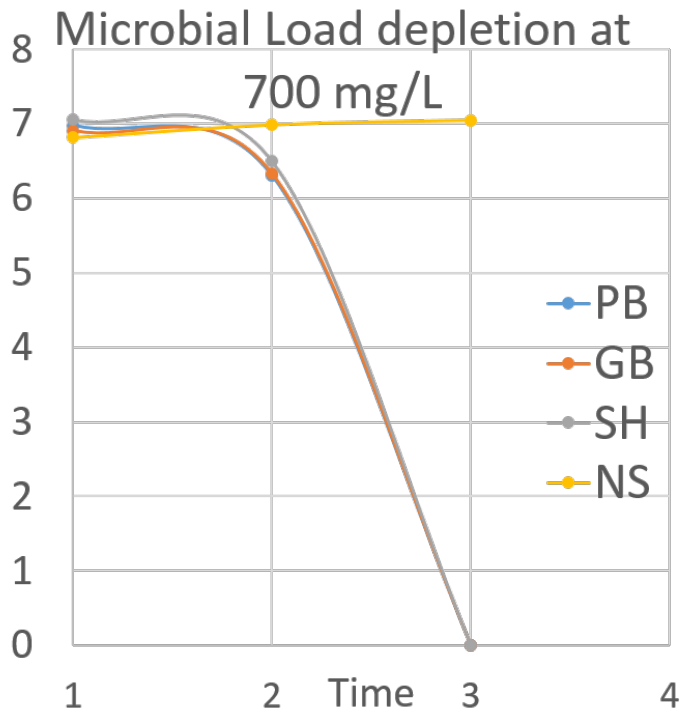
Produce Safety ALLIANCE

NECAFS
The Northeast Center to Advance Food Safety

THANK YOU

Influence of Free Chlorine Using Different Commercial Products





Time 1: Before sanitizer, *Time 2*: After sanitizer, 30 seconds, *Time 3:* After sanitizer, 30 min

* Significant difference at 0 mg/L for GB sanitizer at time 2 and time 3