Center for Produce Safety
2012 Research Review

What's new in food safety for you?



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Presentation Outline

- What is the Center for Produce Safety (CPS)?
- What is the science telling about reducing risk in fresh produce safety?
  - Composting
  - Irrigation water
  - Animal Vectors
  - Wash water
- What makes the CPS successful?
- What is the future for fresh produce safety research for Australia?
  - Have your say

What is the Center for Produce Safety?

- **Private – Public** Partnership located at the University of California, Davis
- **Initial Partners**: Produce Marketing Association, California Department of Food and Agriculture, Univ. of California, Davis
- **All administrative costs** - Funded by the Produce Marketing Association. Initial donation $2M. January 2012 $11M.
- **Research Program** began with a $2M donation from Taylor Farms
- **Funded 69** projects (core, rapid response, proof of concept)
  - $10,564,306, 40 researchers, 26 institutions, 3 countries



CPS Mission

- The Center for Produce Safety provides ready-to-use science-based solutions that prevent or minimize produce safety vulnerability.
- The Center for Produce Safety is recognized as a go-to organization coordinating efforts to enhance the safety of produce.
- **Strategic Priorities**
  - Become a global clearing house and repository of research information
  - Facilitate new actionable research
  - Provide communication, outreach to industry, research and regulatory sectors
  - Fund the strategic plan

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Current Environment

- Consumers expect food to be safe
- Regulators will *always* protect public health
- Farmers want to do “right” thing:
  - ✓Produce industry - great industry
  - ✓Healthy, nutritious food
  - ✓Producers are responsible for safety
- Educators can provide assistance
- Buyers focus on food safety
- Yet… product recalls and outbreaks

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Still some failure to recognise responsibility….

- Extremes on how producers *and* buyers view food safety
  - ✓"Been farming for 3 generations, never had a problem"
  - ✓"We are a little guy, that stuff is for those corporate guys"
  - ✓"Too expensive; who is going to pay for it?"
  - ✓"Just doing what my customers ask me to do"
  - ✓"I am going to wait for regulation"
  - ✓"Consumers need to be more careful"
  - ✓"Ran a little short and just needed a few loads"
  - ✓"I have a national program and then a separate deal for local"

Food safety is about responsibility

- No one size fits all solution
- All stakeholders must be proactive
- Personal
- Can't "keep your head low"
- Producers need to protect their business
- Producers know their operation best
- Following can be dangerous…

***Take responsibility for where you are going…*Denial doesn't work**

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Food safety not about farm size, geography, crop, whole or processed

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Science is answering questions and identifying risk

Three basic questions:

- Where do pathogens come from?
- How do they get on the crop?
- How can we kill them?

Key research areas:

- Compost
- Irrigation water
- Animal vectors
- Wash water sanitation

Composting – problem of survival and regrowth

Complex process that requires controls.

- Technical requirements: pH, C:N ratios 25:1; optimal temperature, rapid heat up times
- Reinfection can occur if not stored properly – risk factors: environment, rainfall, humidity, proximity to pathogens
- Guidelines for storage? Separation from raw materials, covers, short storage times
- Compost particle size matters for *E.coli* O157:H7 survival – large particle size promotes survival
- Compost moisture level matters for *E.coli* O157:H7 survival - Moderate (30%) promotes survival of cf. low (20%) or high (40%)

Composting – problem of survival and regrowth

In the US the FDA will require composters to fully define their process and preventative processes to prevent reinfection

- Grower ultimately responsible for evaluating compost suppliers and assess/manage risks
  - ✓Do they know their suppliers?
  - ✓Do they have a validated composting process?
  - ✓Do they store compost properly?
  - ✓If producers do own composting, do they have a controlled process?
  - ✓Time from application to harvest?
  - ✓Environment for application e.g. wind, proximity to harvestable crops
- Environment plays a role for recontamination

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Irrigation Water

- Testing has limited use in predicting outbreak
  - despite food safety programs relying on them
  - risk based approach to water sampling i.e. low variability – fewer tests; high variability – more frequent sampling;
  - review pattern of results for seasonality, source and other factors.
- *E.coli* counts - an indicator of potential risk?
  - NOT a predictor of *Salmonella* presence
  - highest *Salmonella* readings in Summer, correlated with temperature, rainfall and recreational water use.
  - choice of test matched by potential contamination factors such as animal vectors.

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Irrigation Water

- Source of water
  - on-farm dams had much higher concentrations of *E.coli* than well water sources in California (30% higher)
  - questions pumping well/bore water to on-farm reservoirs where water quality can degrade
- Sampling
  - increasing sample volume = increased probability of detection e.g. 1L
  - where? Side water channels different results to main water channel
  - risk based approach to water sampling i.e. low variability – fewer tests; high variability – more frequent sampling
  - review pattern of results for seasonality, source and other factors

Irrigation Water

- Uptake of pathogens by plants
  - *Salmonell*a didn't enter cucurbit fruit via root systems when drip irrigated with *Salmonella* infected water
  - Second trial which indicates plants may not take up human pathogens via roots
  - Injured tissue however poses a risk.
- Change in sampling methodology
  - Regular testing may be replaced with more frequent and targeted sampling i.e. risk based sampling because of season, volume of sample and location of sampling.
  - Suggest gather results over last 5 years and identify problem sources, and when in the season they are a problem.
  - Net effect - same number of samples (and therefore cost) and focused on risk.
  - Need cooperation between growers.

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Wash Water Sanitation

› The use of a disinfectant does not "sterilize" the product

- they prevent cross contamination
- most systems get microbial reduction of 1-2 log despite initial load
- sanitizers do not penetrate biofilms well e.g. chlorine

› Ideally have a collection of pathogen surrogates

- for validation studies
- a framework for designing validation studies and a mechanism for collecting and sharing industry data as a learning tool

› Comparing different disinfectants

- require protocols

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Wash Water Sanitation

› Know how disinfectants work and how to measure their presence

- Complex management of pH, disinfectant levels, turbidity and OM

› Presence of Organic Matter + Microbial Load

- adversely affects wash water quality resulting in potential for cross contamination
- organic load binds the active chlorine rendering it useless as a disinfectant
- *E.coli* detected at 2% organic load and upwards

› Narrow pH range

- 6.5 ensures sodium hypochlorite disassociates to release hypochlorous acid (disinfectant)
- pH 8.0 hypochlorous acid decreases to 20% of available chlorine

Wash Water Sanitation

- Reliance on Oxidative Reduction Potential (ORP)
  - only one indicator for effectiveness of sanitizer – may not be reliable under conditions of high turbidity or OM
- Internalisation of pathogens
  - Water can infiltrate fruit and vegetables through scars and wounds
  - Product pulp must be < 6° C warmer than water temperature to prevent infiltration
- Establish Critical Control Points and Operational Limits
  - E.g. CCP might be 10 ppm then OCP should be 12 ppm
  - Verification - ongoing measurements and controls to assure that the system is being managed according to the validated plan, and therefore under control at all times
  - Training of staff essential

Animals as pathogen vectors?

- Numerous species are potential vectors
- Amphibians/reptiles shed *Salmonella*), but…
  - ✓ Clinical versus environmental serovars
  - ✓ E. coli O157:H7 rare
  - ✓ Open water sources > well-fed
- Birds can carry pathogens:
  - ✓ Reason to do experiments - Canadian geese!
  - ✓ Look at densities to evaluate
- Dogs can carry multiple pathogens
- Game animals may vector pathogens

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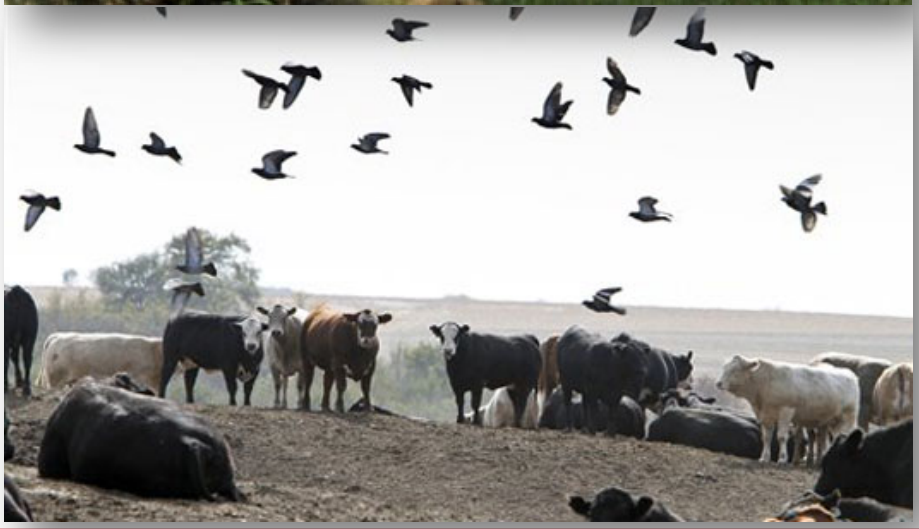
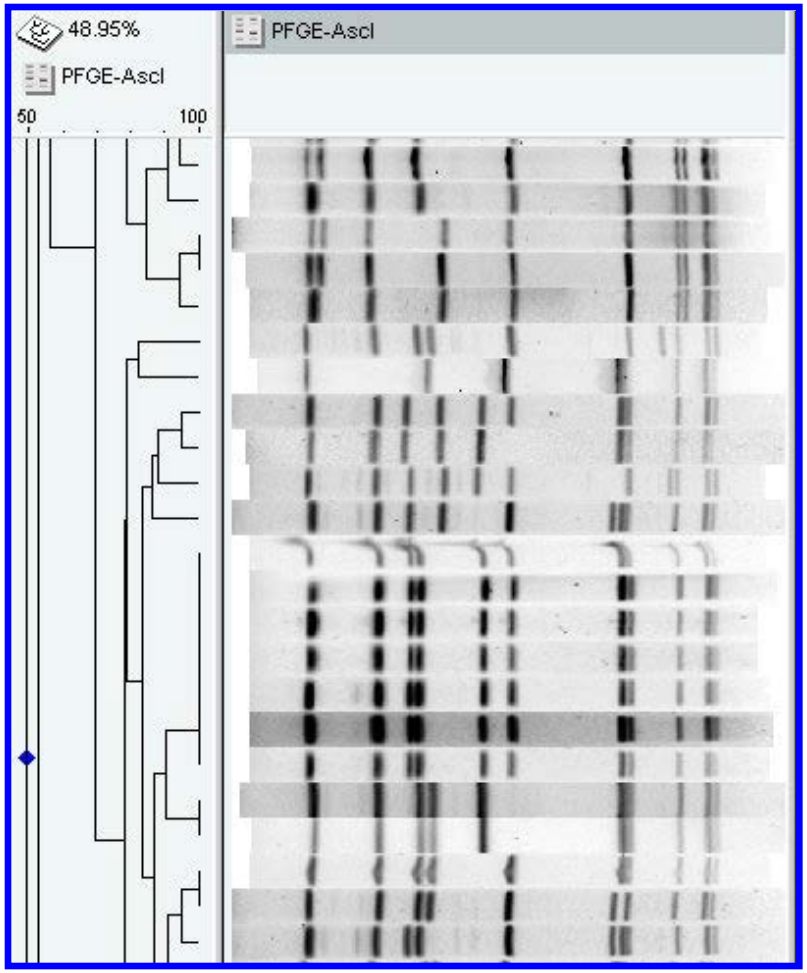


- Wild animal risks need to be managed
  - ✓ Pre-harvest inspection
  - ✓ Buffer zones
  - ✓ Physical barriers, e.g. water sources
- Animal risk consideration in context of environment:
  - ✓ Most “risky” list don’t work
  - ✓ Identify source/exposure – prevent infection of animals
  - ✓ Densities of animals – feedlots a real concern
  - ✓ Proximity to field

New Tools

- Riboprinter® system – rapid detection of pathogen type and serovar Dupont Qualicon
- T-128 GRAS chemical - chlorine stabilizer under high organic load
- Zero Valent iron water filtration system - add to sand filtration systems to filter our *Salmonella* and *E.coli* O157:H7 (works for smaller volumes)



What's next for Australia?

A New Collaborative Paradigm for Fresh Produce Safety – 2012/13

- funded by HAL, the University of Sydney and PMA A-NZ
- explored fresh produce safety research centre affiliated with the CPS at the UC Davis

Outcomes of the project:

- a Fresh Produce Safety Workshop in October 2012 with 3 keynote speakers from CPS USA
- a Fresh Produce Safety Website established as the go-to site for industry information
- a Fresh Produce Safety Newsletter for the fresh produce industry
- a partnership in 2013 with CPS to fund 2 research projects relevant to the Australian industry
- raised awareness of the issues in fresh produce safety in Australia

Partners In Research

Why the CPS approach successful:

- Makes food safety research accessible
- Each party brings much experience to the problem and the relationship
- Partnering with industry keeps the leadership role within industry
- Matching funds

What can we do?

Proposal for new Australian Fresh Produce Safety Centre affiliated with CPS in the US

Have your say…. Survey being sent to your email

CPS Research Symposium

CPS 4th Annual Produce Research Symposium

Wegmans Conference Center

June 26, 2013

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Filling the Knowledge Gaps: What are the Australian Food Safety Research Priorities?

Emma Walters

11 April 2013

THE UNIVERSITY OF SYDNEY

Filling the Knowledge Gaps: What are the Australian Food Safety Research Priorities?

Objective of this Session

- To answer the question:

  "What unique fresh produce food safety challenges are there in Australia that we need answered by research to reduce risk?"

Filling the Knowledge Gaps: What are the Australian Food Safety Research Priorities?

Eight Groups

› Turn your name badges over!

 - Water - Field Operations and Irrigation

 - Water - Wash Water

 - Microbial Research

 - Pathogens in the Post-harvest Distribution Chain

 - Compost and Organic Fertiliser Usage

 - Harvest and Cooling Practices

 - Chemical Residue Research

 - Regulation and Protocols

Filling the Knowledge Gaps: What are the Australian Food Safety Research Priorities?

Your Task

› Discuss the broad area you have been allocated and the session objective:

"What unique fresh produce food safety challenges are there in Australia that we need answered by research to reduce risk?"

› Then determine **1 to 2 specific research questions** your group need/would like addressed in that area.

› You have 30 minutes to discuss in your groups

› You must write the 1 to 2 specific research questions on large paper, and appoint someone to report back for two minutes

› We will then have a brief discussion about each group's presentation.

Filling the Knowledge Gaps: What are the Australian Food Safety Research Priorities?

Example of Research Questions

Taken from CPS current call:

- What mitigation step(s) can be applied to various agricultural water sources that would diminish the risk of pathogen contamination to the crop?

- How significant is the risk of transfer of foodborne pathogens from soil to crops grown above the ground (e.g., tree fruits or other crops cultivated on poles, trellises)?