

RUTGERS

New Jersey Agricultural
Experiment Station

Reducing Food Safety Risks Associated with Fresh Produce

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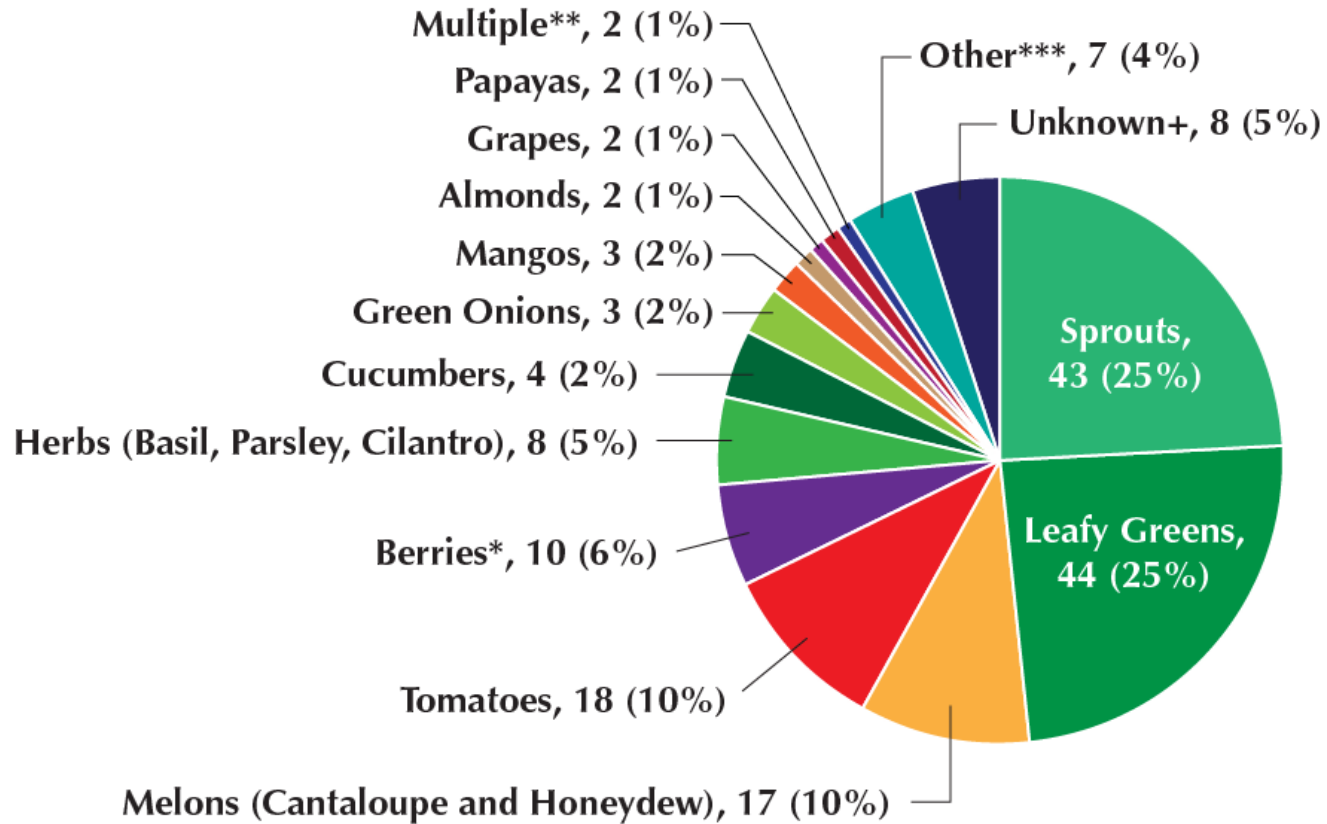
Rutgers NJAES Cooperative Extension of Mercer County

Wes Kline, Ph.D.

Rutgers NJAES Cooperative Extension of Cumberland County

Outbreaks Associated with Produce

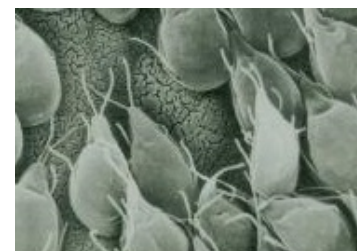
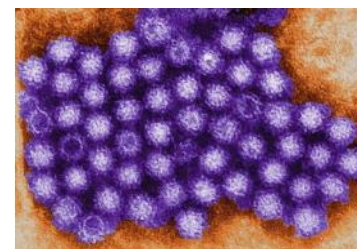
FDA Outbreaks Linked to Produce Contamination Likely Prior to Retail: 1996–2014





Microorganisms of Concern in Fresh Produce

- Bacteria
 - *Salmonella*, toxigenic *E. coli*, *Shigella*, *Listeria monocytogenes*
- Viruses
 - Norovirus, Hepatitis A
- Parasites
 - *Giardia lamblia*, *Cryptosporidium parvum*, *Cyclospora cayetanensis*





Bacteria in the Environment

- Bacteria are microorganisms that can multiply both inside and outside of a host
- Bacteria include pathogens such as *E. coli* O157:H7, *Salmonella*, and *Listeria monocytogenes*
- Bacteria can multiply rapidly given the right conditions: water, food, and the proper temperature
- Good Agricultural Practices can reduce risks by minimizing situations that support bacterial survival and growth





Bacteria

- If conditions are ideal, bacteria can multiply once every 20 minutes
- It is unlikely you'll ever start with just ONE bacterium
- Some pathogens can make people sick with a dose of 10 cells or less
- What conditions are optimal?
 - Food source
 - Moisture
 - Right temperature

Time	# of Bacteria
20 min	2
40 min	4
1 hour	8
80 min	16
100 min	32
2 hours	64
4 hours	4096
6 hours	262,144
8 hours	16,777,216

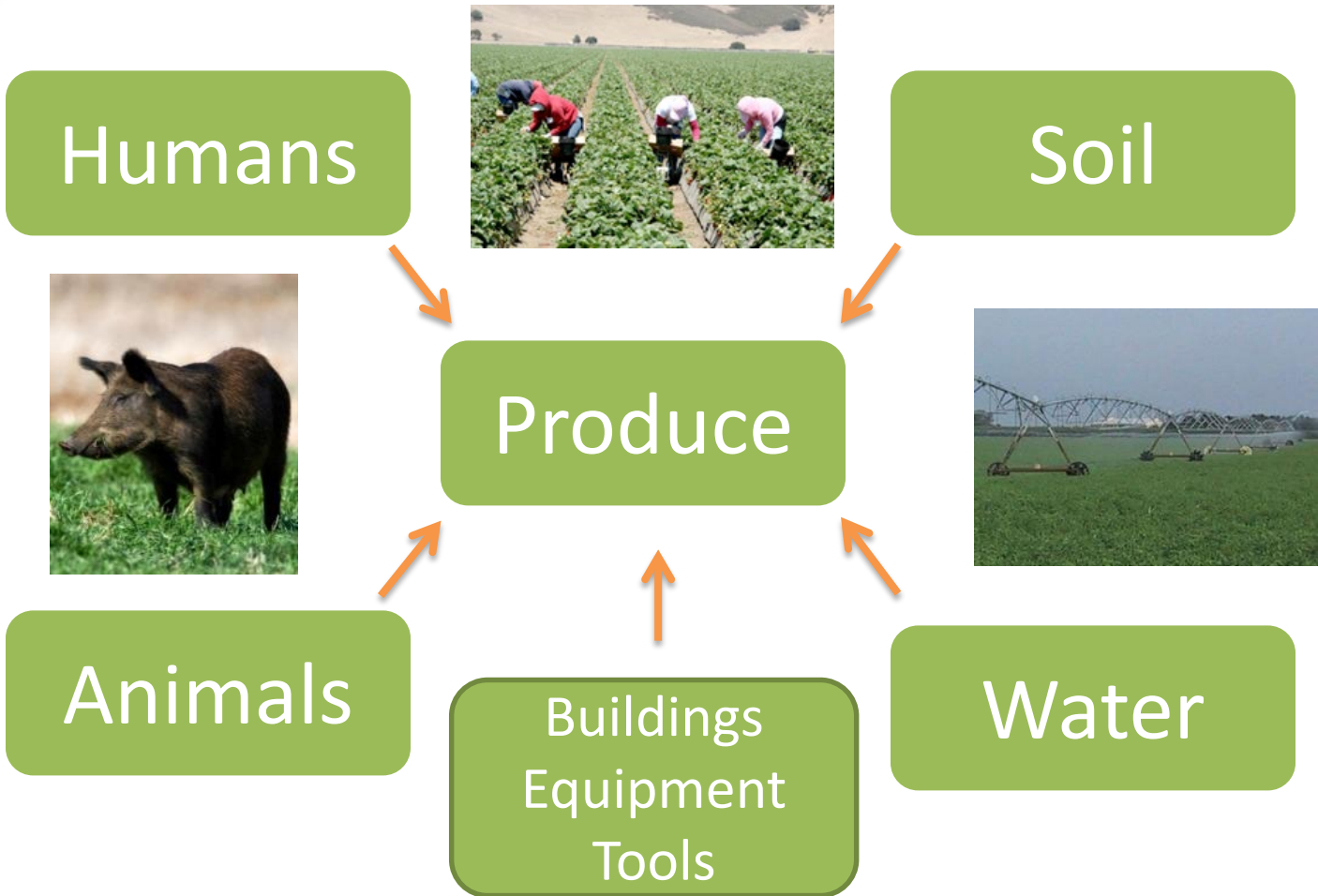


Produce Safety Challenges

- Fresh produce is often consumed raw (i.e., not cooked)
- Microbial contamination on produce is extremely difficult to remove once present
 - Natural openings, stem scars, bruises, cuts
 - Rough surfaces, folds, netting
- Contamination is often sporadic
- Bacteria can multiply on produce surfaces and in fruit wounds, provided the right conditions are present



Contamination Sources





How Contamination Is Spread

- **Humans**

Workers can spread pathogens to produce because they directly handle fruits and vegetables.

- Improper health and hygiene practices

- Lack of adequate training and handwashing practices
- Lack of or inadequate toilet facilities

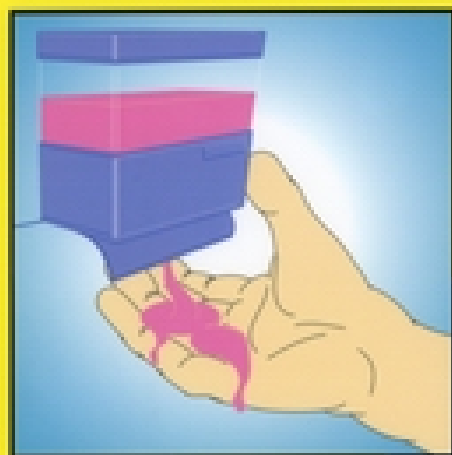
- Illness or injury

- Working while sick
- Injuries that result in blood contacting fresh produce



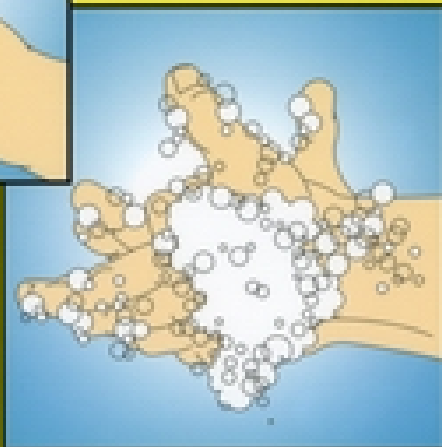


POR FAVOR, LÁVESE LAS MANOS FRECUENTEMENTE



ANTES Y DESPUÉS
DE USAR EL BAÑO,
MANIPULAR FRUTAS Y
VERDURAS, COMER,
BEBER, O FUMAR

BEFORE AND AFTER
USING THE TOILET,
HANDLING FRUITS
AND VEGETABLES,
EATING, DRINKING,
OR SMOKING



This poster was produced by the Food Agricultural Protection Program at Cornell University with support from USDA/APHIS and FSA Agreement No. 46-1100-001.

PLEASE WASH YOUR HANDS OFTEN!

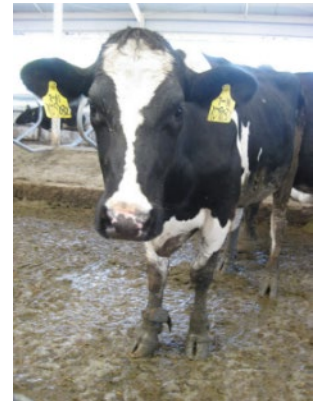


How Contamination Is Spread

- **Animals**

Domesticated and wild animals can carry and transmit human pathogens to produce.

- Field intrusion may result in direct fecal contamination of crops and fields
- Animal feeding, rooting, and movement through fields may spread contamination
- Animals can contaminate water sources used for produce production
- Manure runoff can contaminate fields, water sources, and crops





Produce Safety
ALLIANCE



How Contamination Is Spread

- **Water**

Water can carry and spread human pathogens, contaminating entire fields or large amounts of produce.

- Production water

- Irrigation, crop sprays, frost protection

- Postharvest water

- Fluming, cooling, washing, waxing, cleaning

- Unexpected events

- Flooding, runoff







How Contamination Is Spread

- **Soil Amendments**

Raw manure and other soil amendments can be a source of contamination if not properly handled and applied.

- Application too close to harvest
- Improper/incomplete treatment
- Improper storage
- Runoff
- Wind spread
- Cross-contamination due to improper sanitation procedures





How Contamination Is Spread

- **Surfaces, equipment, tools, and buildings**

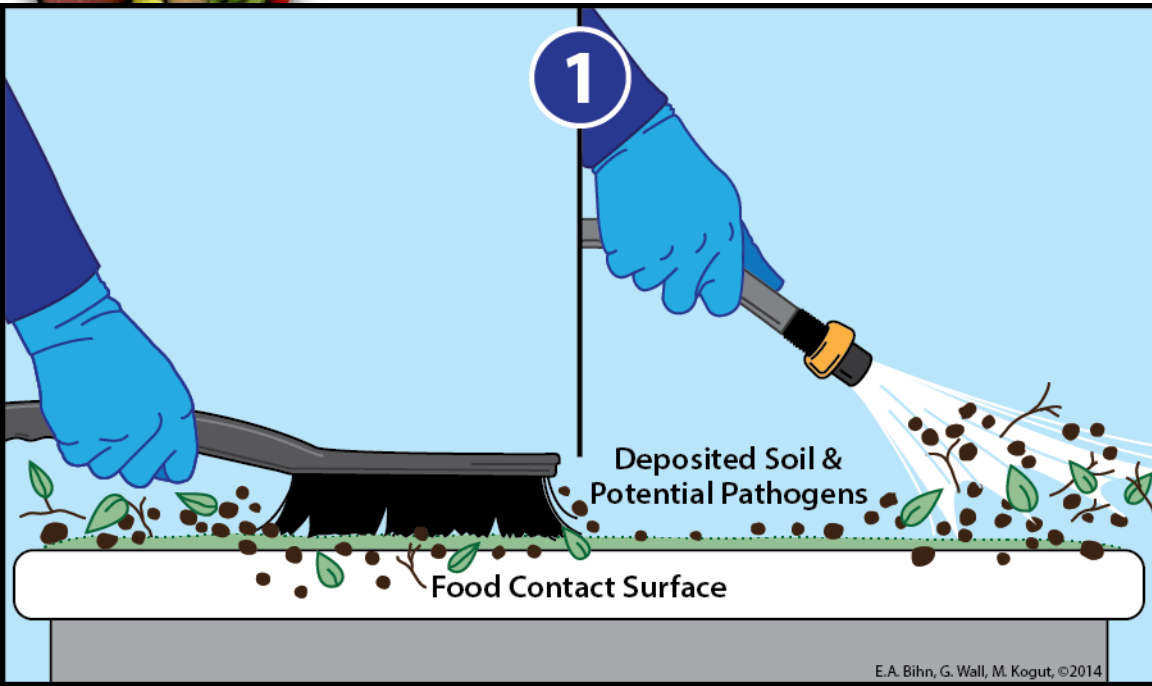
Any unclean surface that contacts produce can harbor pathogens and serve as a source of contamination.

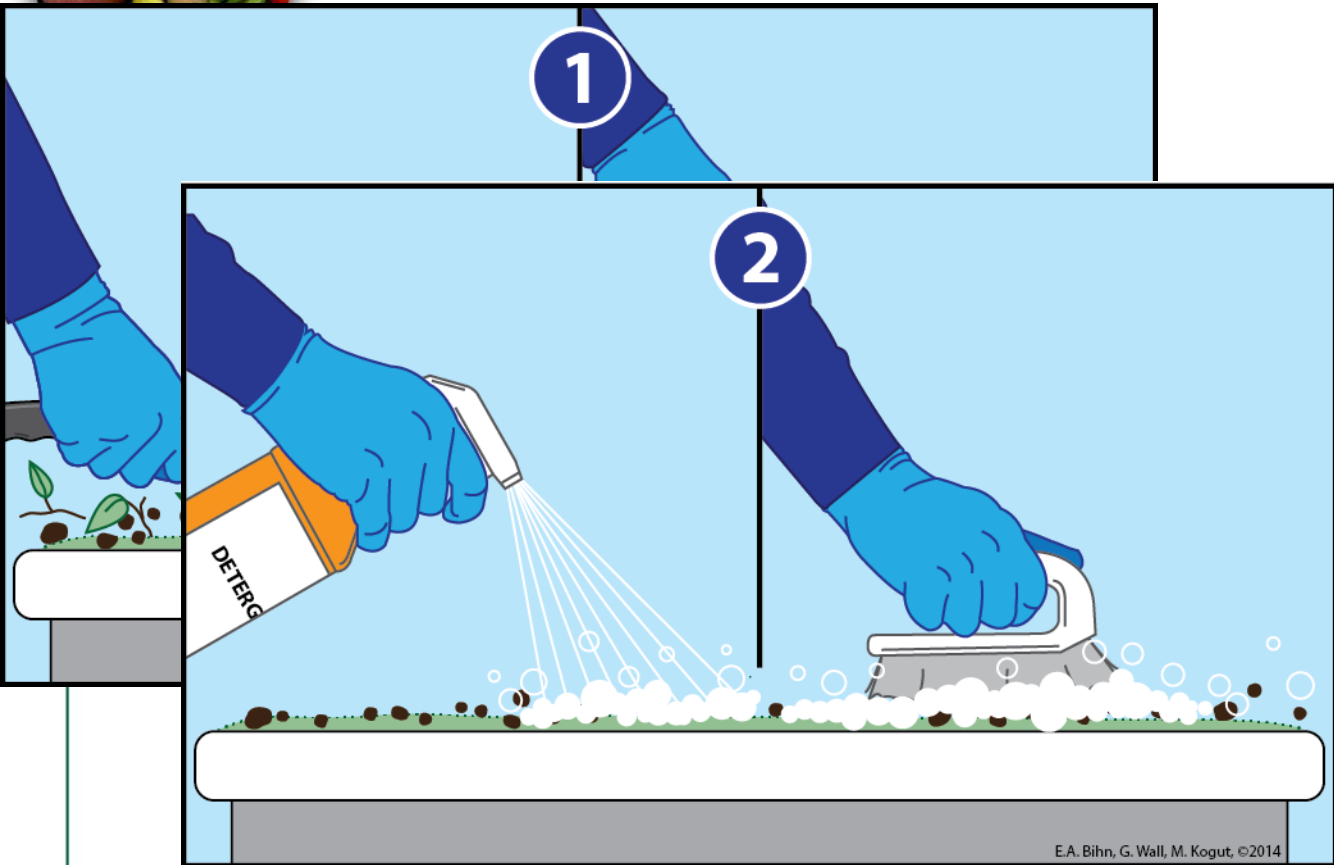
- For example, not having an established schedule for cleaning or sanitizing food contact surfaces, including tools

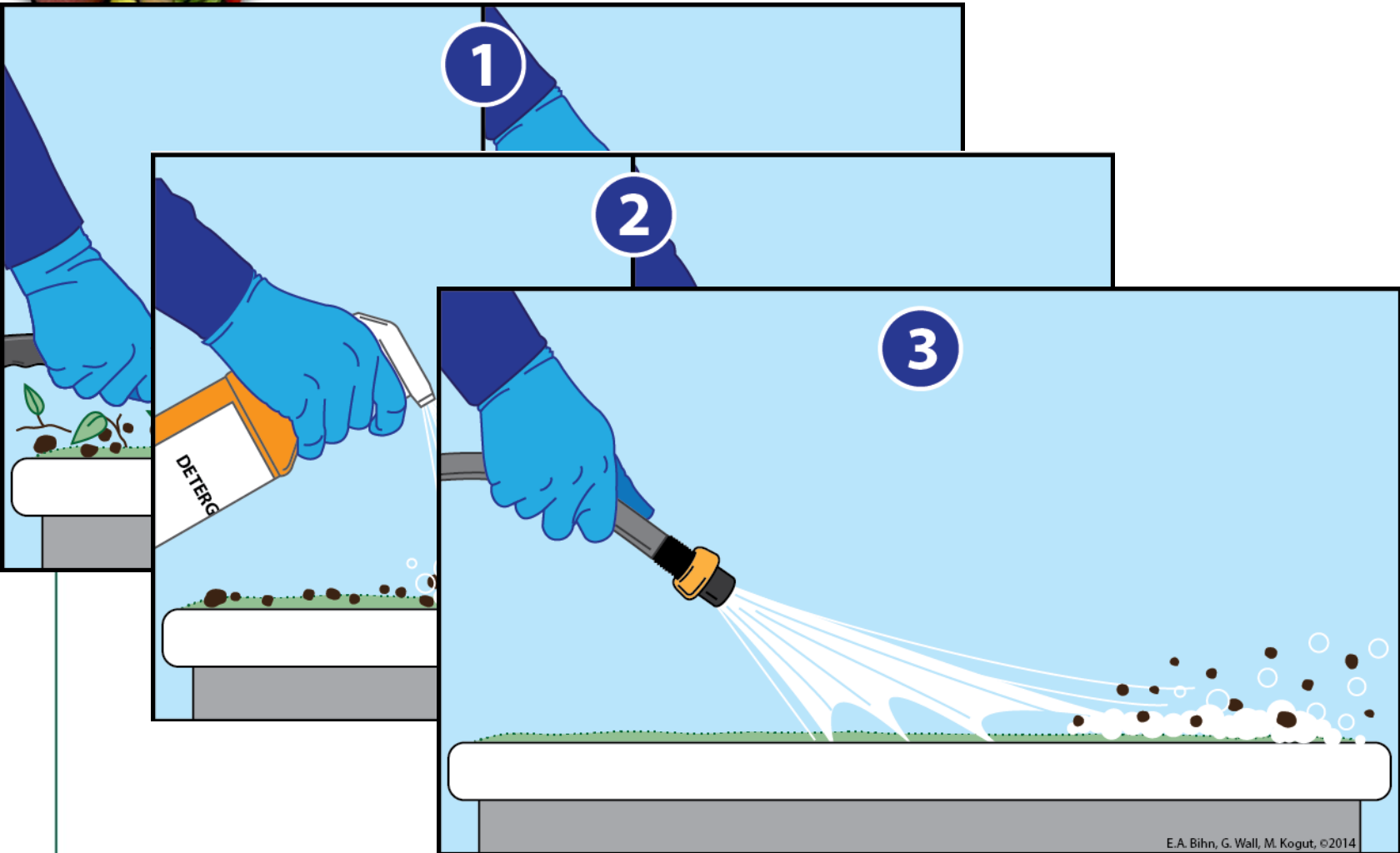
Facility management can also impact risks

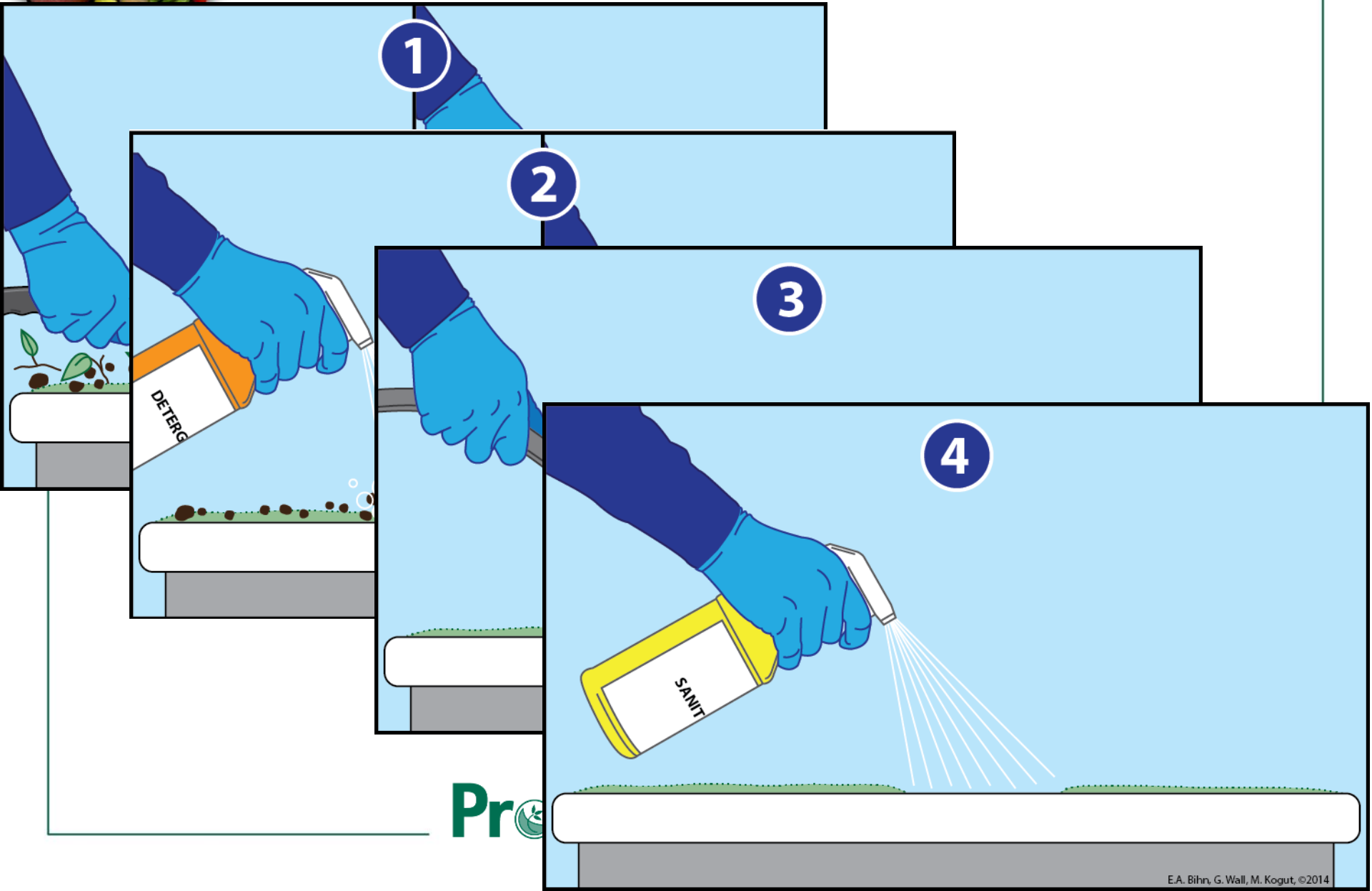
- Areas outside buildings that are not kept mowed or clean can serve as pest harborage areas
- Standing water or debris present in the packinghouse can become a source of cross-contamination







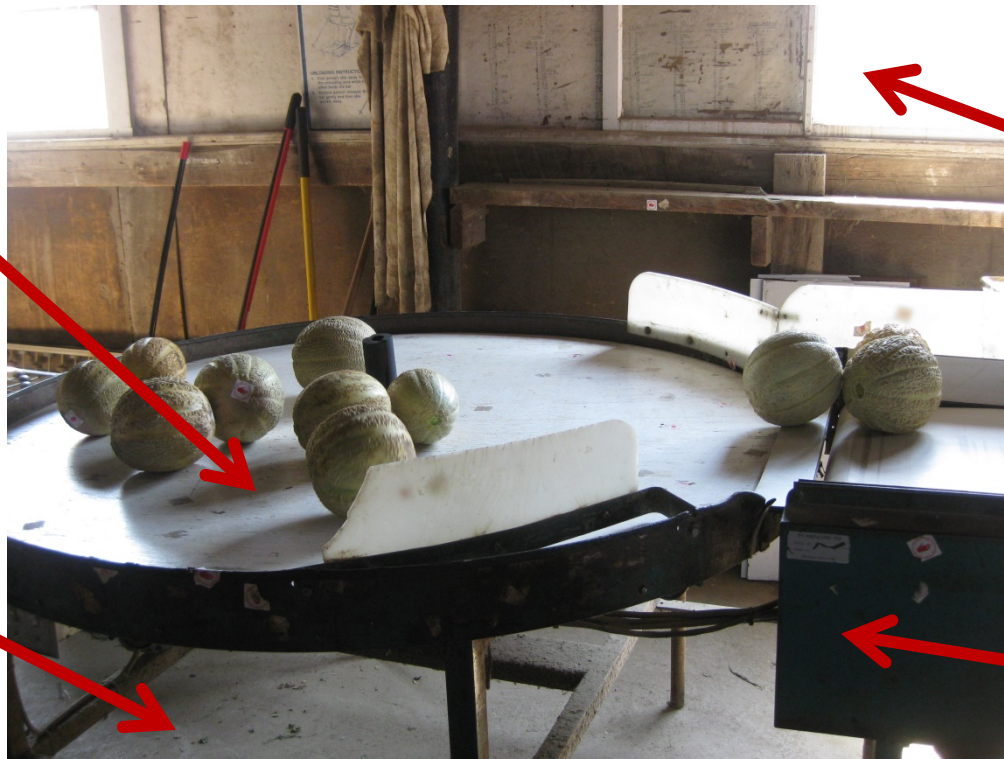




Pro



Zone 1
(direct food
contact surface)



Zone 4
(outside)

Zone 3
(floor)

Zone 2
(outside surface
of washer)



Steps Towards Produce Safety

1

- Assess Produce Safety Risks

2

- Implement Practices

3

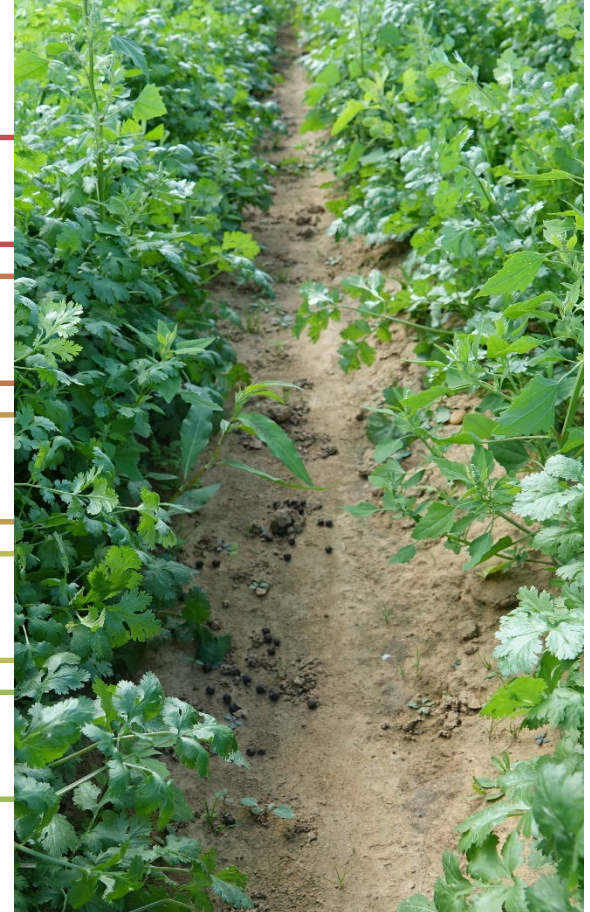
- Monitor Practices

4

- Use Corrective Actions

5

- Keep Records



Historical Rutgers Farm Food Safety Outreach

- Outreach began in 1999 because growers asked for it
- Third party audit focused
- Certificate based trainings
- Mock audit farm visits
- Food safety plan writing assistance
- Validation of sanitation practices



Buyer Required Third Party Audits

Food Safety Modernization Act

FSMA Rules

- Accredited Third-Party Certification
- Current GMP and Hazard Analysis and Risk-Based Preventive Controls for Human Food
- Current GMP and Hazard Analysis and Risk-Based Preventive Controls for Animal Food
- Foreign Supplier Verification
- Intentional Adulteration
- Sanitary Transport of Human and Animal Food
- Standards for Growing, Harvesting, Packing, and Holding of Produce for Human Consumption

How does food safety help a farmer?

- Increases the quality of their produce
- Allows market access
- Identify and connect with resources including technical assistance
- Could increase shelf-life of produce
- Improves customer communication about production, harvest, handling, storage, and transportation of their product

Questions?