

An aerial photograph of a large pecan orchard. The trees are arranged in neat, parallel rows, creating a grid-like pattern. In the center of the orchard, a blue tractor is visible, moving through the rows. The ground between the trees is a mix of green grass and brown soil. The overall scene is lush and green, indicating a healthy orchard.

# Good Agricultural Practices for Pecans

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# Good Agricultural Practices (GAPs) Reduce Risks of Microbial Contamination

- GAPs Topics

1. Water
2. Manure and Municipal Biosolids
3. Worker Health and Hygiene
4. Sanitary Facilities
5. Field Sanitation
6. Shelling/Cleaning Facilities
7. Transportation
8. Traceback



# Why Should We Care?

Every year microbial contamination results in an estimated:

- 76 million cases of foodborne illness.
- 325,000 people hospitalized for foodborne illness.
- 5,200 needless deaths each year.
- Economic losses between 10-83 billion dollars.

# How many outbreaks have been linked to Nuts?

Variety	Product	Pathogen	Year	Outbreak Location(s)
Almond	Raw whole	<i>Salmonella</i> Enteritidis PT 30	2000-01	Canada, USA
	Raw whole	<i>Salmonella</i> Enteritidis PT 9c	2004	Canada, USA
Coconut	Raw whole	<i>Salmonella</i> Enteritidis	2005-06	Sweden
	Desiccated	<i>Salmonella typhi</i> , <i>Salmonella</i> Senftenberg and possibly others	1953	Australia
	Desiccated	<i>Salmonella</i> Java PT Dundee	1999	United Kingdom
Hazelnut	Milk	<i>Vibrio cholerae</i>	1991	USA
	Conserve (for yogurt)	<i>Clostridium botulinum</i>	1989	United Kingdom
Peanut	Canned	<i>Clostridium botulinum</i>	1986	Taiwan
	Savory snack	<i>Salmonella</i> Agona PT 15	1994-95	United Kingdom, Israel
	Peanut butter	<i>Salmonella</i> Mbandaka	1996	Australia
	Flavored or roasted in-shell	<i>Salmonella</i> Stanleyand <i>Salmonella</i> Newport	2001	Australia, Canada, United Kingdom
	Peanut butter	<i>Salmonella</i> Tennessee	2006-07	USA
	Peanut butter, peanut butter-containing products	<i>Salmonella</i> Typhimurium	2008-09	USA
Sesame seed	Halva	<i>Salmonella</i> Typhimurium DT 104	2001	Australia, Sweden, Norway, United Kingdom, Germany
		<i>Salmonella</i> Montevideo	2002	Australia

# Intrinsic Safety of Pecans - Beliefs

- The thick shells of some nuts are thought to be an effective barrier to microbial penetration
- The presence of a hull or husk is thought to further reduce the risk of microbial invasion.
- The internal surface of a dry intact kernel picked from the tree is virtually sterile (Chipley and Heaton, 1971; Meyer and Vaghun, 1969)

# Intrinsic Safety of Pecans - Reality

- Hull or shell splitting can occur on the prior to or after harvest
  - Different varieties have widely differing shell thicknesses
  - Birds, other vertebrates or insects may also damage the shell
  - Shells may crack along the suture during wetting or drying.
  - Pecan nut packing tissue is toxic to salmonella, affording some protection to initial contamination and survival (Beuchat and Heaton, 1974).

# Pecan Outbreaks

- July 2009
  - General Mills announces recall of certain lots of **Nature Valley Granola Nut Clusters**, due to the possibility that pecans used in the **Nut Clusters** might be "... tainted with *Salmonella*."



# So what can be done?

- Prevention
  - Try to avoid contaminating the product in the first place.
  - *Once food becomes contaminated, its almost impossible to clean completely.*



# GAPs - Water

- This consideration should include water used for irrigation, mixing pesticides and other foliar-applied products, equipment sanitation, product sanitation, and cooling operations.
- The operator should be aware of the source, distribution, and quality of all water utilized.

# Water Carries Pathogens

- *E. coli* O157:H7 viewed primarily as a water-borne pathogen.
- *Salmonella*, *Giardia* and *Cyclospora* outbreaks on produce caused by contaminated water.



# Spray Water Quality

- **Use potable (drinking) water for pesticide sprays.**
- **When potable water is not available, test water quality and keep records.**



# GAPs – Manure and Municipal Biosolids

- Properly treated manure or biosolids can be an effective and safe fertilizer if the proper precautions are in place.
- Use treatments to reduce pathogens in manure and other organic materials. Treatments may be active (e.g., composting) or passive (e.g., aging).



# GAPs – Manure and Municipal Biosolids

- Be aware that sitting manure treatment and storage sites close to orchards increases the risk of contamination.
- Consider factors such as slope and rainfall and the likelihood of runoff into orchard
- Use barriers or physical containment to secure storage and treatment sites.
- Do not apply manure to the orchard <180 days prior to harvest





# Exclude Animals

- Manage rodents and birds in cleaning plants and storage areas.
- No dogs or other pets in the orchards.
- Keep wildlife out of production areas as much as possible.



# *Salmonella* and nut production

- Grazing domestic animals is practiced in some regions
  - *E. coli* levels on pecans increased from 4% to 23% following grazing
  - Contamination on pecans increased to 36%, with grazing in a wet production year (Marcus and Amling, 1973)



Courtesy of Dr. M. Danyluk

# GAPs – Worker Health and Hygiene

- Train employees to follow good hygiene practices.
- Establish a training program about health and hygiene. Include basics, such as proper handwashing techniques and the importance of using toilet facilities.
- Become familiar with typical signs and symptoms of infectious diseases.
- Offer protection to workers with cuts or lesions



# GAPs – Sanitary Facilities

- Toilet facilities should be properly located.
- Toilet facilities should be accessible and clean.
- Toilet facilities and handwashing stations should be well-supplied.



# GAPs – Field Sanitation

- Clean harvest containers or bins prior to use.
- Use harvesting equipment appropriately and keep it as clean as practicable.



# GAPs – Cleaning Plants/Shelling Facilities

- Proper sorting and culling.
- Enforce Good Worker Hygiene.
- Exclude all animals from facility, especially insects, birds and rodents.
- Clean and Sanitize Equipment.
- Detectable Free Chlorine in Wash Waters.



# GAPs - Transportation

- Good hygienic and sanitation practices should be used when loading, unloading, and inspecting pecans.
- Inspect transportation vehicles for cleanliness, odors, and obvious dirt and debris before loading.
- Avoid leaving harvested crop in the sun and maintain proper temperatures throughout the transportation process.
- Load pecans to minimize cracking.

# GAPs - Traceback

- Documentation should include the source of the product, the date of harvest, farm identification, and a record of who handled the product.
- The product must be traceable from the farm through the accumulator, sheller, distributor, transporter, and retailer.

If you did not  
**RECORD IT,**  
you did not do it.

- Record keeping allows you to keep track of farming and packing operations and worker training.
- Record keeping documents your activities should this information ever be required.



# Be Active and Be Ready

- Make changes to management practices as needed.
- Keep good records of all production practices.
- Teach employees the importance of prevention strategies and provide proper facilities.
- Work with upstream neighbors and local watershed committees on management goals.
- Update your plan regularly.