



THE UNIVERSITY OF  
**MAINE**  
Cooperative Extension



# Food Safety in the Garden

# Good Agricultural Practices

## GAP

- **Goal:** reduce microbial risks in home grown fruits and vegetables to make produce safer.
- **Reduce risk** of foodborne illness
- **Integrate** food safety into home gardening practices



# Why Worry?

## Produce Safety:

- 46% of foodborne illness linked to fresh produce. \*
- Recent outbreaks have raised awareness
- What does this have to do with your home garden?

\*2003-2006, CDC

# GAP in the Home Garden

## Home Gardens - many issues the same

- Water safety
- Domestic/Wild animals
- Use of compost
- Use of manure
- Personal hygiene/sanitation
- Post-harvest handling and temperature control



# Food Safety Review

Unsafe/contaminated food is very hard to detect

- It can look fine
- It can smell fine
- It can taste fine



# Foodborne Illness

## Symptoms

- Nausea
- Vomiting
- Diarrhea
- Headache
- Fever



A “tiny taste” will not protect you ...

... as few as **10 bacteria** could make you sick!

# People at Greatest Risk

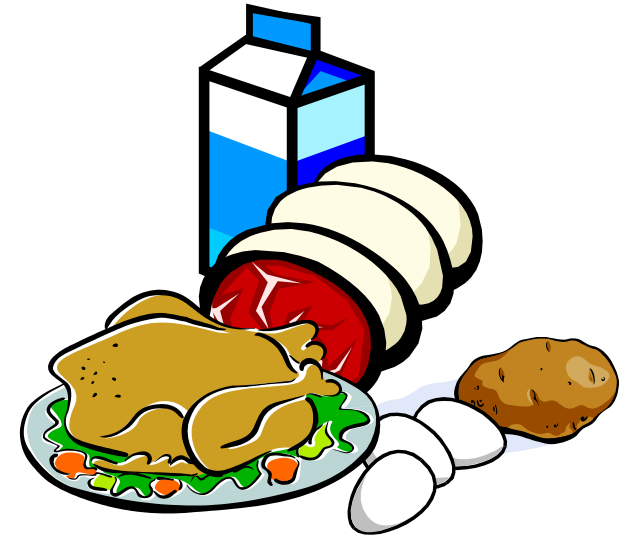
- Infants & children
- Pregnant women
- Elderly
- People with weakened immune systems



# Sources of Foodborne Illness

## Potentially Hazardous Foods

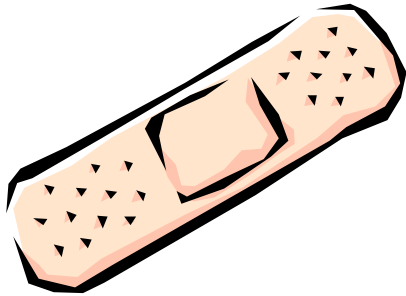
- Undercooked meats
- Dairy
- Eggs
  
- Fresh produce
  - “ready to eat”





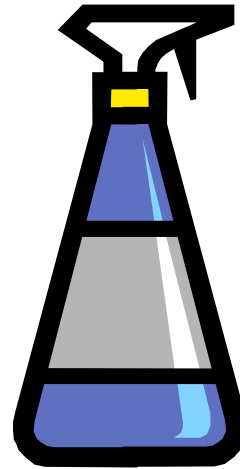
# Food Safety Hazards

## 3 Types of Contamination



### Physical

Plastic  
Glass  
Metal  
Wood  
Bandages  
Jewelry



### Chemical

Allergens  
Pesticides  
Sanitizers  
Lubricants



### Biological

Parasites  
Viruses  
Bacteria

# Food Safety Hazards

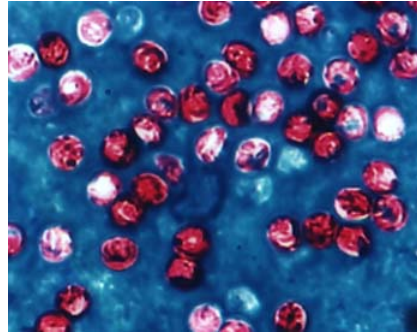
## Chemicals:

- Pesticides: Use only according to manufacturer's directions
- Keep chemicals in original labeled containers
- Toxins from mold
  - e.g. patulin in apples



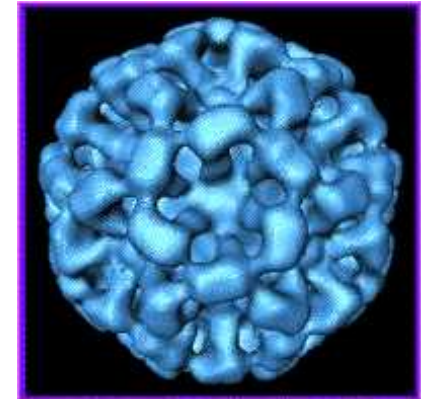
# Biological Food Hazards

➤ **Parasites**



*Cryptosporidium parvum*

➤ **Viruses**



*Norwalk virus*

➤ **Bacteria**



*Salmonella spp.*

# Sources of Contamination

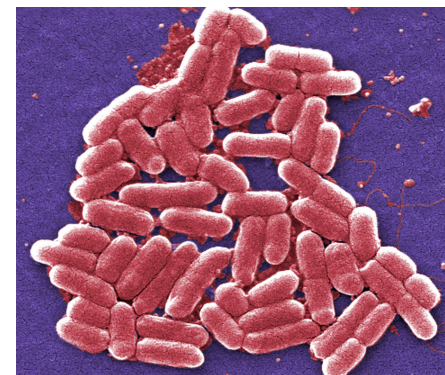
## Biological Contamination

- Animals
  - wild and domestic
  - manure
- People
  - Contagions
- Environment
  - Water
  - Soil



# Sources of Contamination

- **Animal/human intestinal tract**
  - *Salmonella*
  - *E.coli O157:H7*
- **Human**
  - *Shigella*
  - *Hepatitis A virus*
  - *Norovirus*
  - *Staphylococcus*
- **Environment**
  - *Listeria*
  - *Clostridium*
  - *E.coli O157:H7*
- **Water**
  - Most of the above



# Bacterial Contamination

## To Grow, Bacteria Need:

- ✓ Food source
- ✓ Moisture
- ✓ Low in acidity (high pH)
- ✓ Oxygen
- ✓ Correct temperature
- ✓ Time to grow



# Bacterial Contamination

## To Grow, Bacteria Need:

✓ Correct temperature

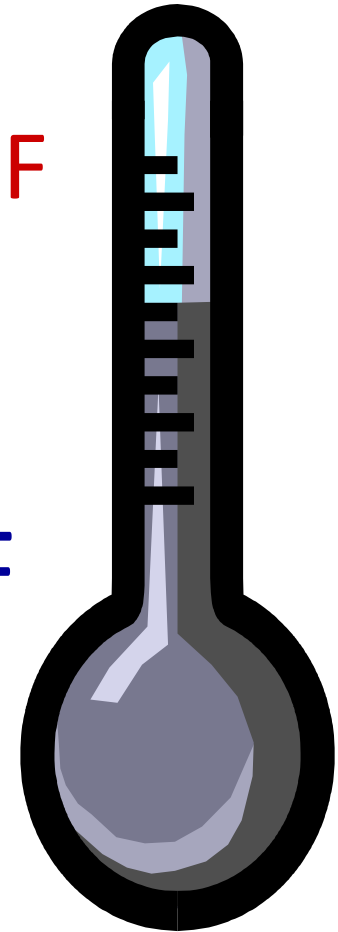
140 ° F

“Danger Zone”



40 ° F

- Cook foods to above 140°
- Store below 40°



# Bacterial Contamination

## Potential sources from the garden

- Soil
- Water
- Manure/Compost
- Wild and Domestic Animals
- Personal Hygiene/Sanitation
- Containers
- Wash and Rinse Water/Inadequate drying
- Post-harvest handling and temperature control





# Good Gardening Practices

## Keep safe throughout the garden year

- Preparing the garden for planting
- Planting → growing
- Harvesting garden produce
- Storing garden produce
- Preparing and serving produce



# Personal Hygiene

## Important at all stages of gardening

- Proper handwashing - after working in the garden, using the bathroom, and *before* preparing fruits and vegetables
- Be aware of illness symptoms. If ill, especially diarrhea, have someone else do the gardening.
- Cover open cuts and sores



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# Using Manure in the Garden

## Animal manures

- provide nutrients
- add organic matter
- Source of human pathogens
  - *E. coli, Salmonella, Listeria*



Fresh manure *not* recommended for use,  
however.....

# Using Manure in the Garden

## Best practices for using manures:

- Manure should be thoroughly composted
- Apply manure in the fall, *after* harvest
- Spring applications
  - **Not recommended**
  - Spread at least two weeks before planting
  - NO harvesting until 120 days after application
  - Incorporate into soil – NO sidedressing
  - Avoid root and leafy crops year of application

# Using Compost in the Garden

Proper composting can produce a safe product

- Adds nutrients
- Adds organic matter

Incomplete compost can harbor pathogens



# Using Compost in the Garden

## Practice safe composting to discourage pathogens

- Do not use animal waste or meat/dairy scraps
- Compost temperature should reach at least 140°F for 3 days to destroy pathogens
  - Need at least 27 cubic feet - smaller needs more attention to get heat.
- Turn pile regularly to aerate



# Using Water in the Garden

Water can be a source of a variety of pathogens

- E. coli
- Listeria



Know the source of water used for your garden.

# Using Water in the Garden

- Municipal or public water systems
  - best source and lowest risk.
- Surface water (lakes, ponds, streams, rainwater)
  - more likely to have microbial contaminants
- Private wells from ground water
  - safe if tested annually
- Use only clean, potable/drinking water to water garden close to harvest and during post-harvest handling.



# Using Water in the Garden

## Protect your well water

- Keep away from pollution sources
  - Septic systems, animal pens
- Check well casing, cap, age, type, depth
  - Dug vs. drilled, access
- Test 1/year



# Using Water in the Garden

## Protect your well water

- Backflow
  - Occurs when contaminated water (non-potable) gets drawn into or flows back into clean water (potable) supply
    - Example: Back Siphoning



# Using Water in the Garden

## Protect your well water

- Backflow prevention
- **Disconnect** sprayers or chemical containers from hose after use
- **Purchase** backflow prevention devices
  - Hardware store, plumbing supply
  - Hose bib for end of hose
  - Consult plumber, check building codes



# Animals in the Garden

## Animals are a source of pathogens

- Keep pets out of garden
- Deter wild animals
  - ✓ Minimize vegetation around gardens
  - ✓ Deterrents - fencing, noise
  - ✓ Call Cooperative Extension for help



# Organic Gardening

- Microbial food safety issues are a problem whether a gardener uses organic or conventional gardening methods.
- Microorganisms are in the environment - air, soil or water.
- Follow safe gardening practices



# Harvesting Produce

**Humans are the major source of disease transmission in food.**

- Personal hygiene – washing, covering wounds
- Change, wash dirty clothes/shoes after working in the garden
- Harvest using clean, food-grade containers



# Harvesting Produce

## Harvest Time

- Handle produce as little as possible
- Dispose of damaged fruit
- Don't eat directly from the garden!
  - Properly wash all fruits and vegetables prior to eating



# Harvesting Produce

## Harvest Time

- Don't eat directly from the garden!





# Post-Harvesting Handling

**Keys to storage:** *focus on safety and quality*

- Ripen some produce before refrigeration e.g. apples, tomatoes, melons.
- Store certain produce in cool, dry, well ventilated, clean places e.g. onions, potatoes.
- Look for signs of spoilage - throw out
- Store produce **above** meat, poultry, fish - avoid **cross-contamination** by separation.
- Refrigerate raw pre-cut or cooked produce in covered containers

# Post-Harvesting Handling

## Washing produce

- If washing before storage thoroughly dry to prevent spoilage and mold growth
- If not washing before storage - brush dirt off
- Refrigerate in clean, plastic bags.
- Some produce should not be washed before storage (e.g. berries)
- Always wash just prior to eating



# Post-Harvesting Handling

## Washing produce

- Very cold water may cause pathogens to be absorbed into the produce through stem or blossom end
- Wash water should not be more than 10 degrees colder than the produce.



# Post-Harvest Handling

## Preparing produce

- Practice good personal hygiene.
- Wash hands before preparation
- Wash produce in cool, clean running water to help remove filth and bacteria



# Post-Harvest Handling

## Preparing Produce

- Do not use soap or detergent
- Bleach *not* recommended for home use
- Wash produce skin with brush to help minimize filth or bacteria transfer to eatable portion



# Post-Harvesting Handling

## Preparing-serving fresh produce

- Cut away bruised or damaged areas
- Avoid cross-contamination
  - Knives, cutting boards, plates, containers
- Keep work area and utensils clean.
- Refrigerate leftovers in covered containers



# Preserving Produce

## Resources

National Center for Home Preservation:  
<http://www.uga.edu/nchfp/index.html>

Home Food Preservation:  
Resources for Safe Food Preservation  
<http://foodsafety.cas.psu.edu/preserve.html>

Home Canning.com (Ball/Kerr)  
<http://www.homecanning.com/usa/>

UMaine Cooperative Extension  
Beth Calder, Jason Bolton



# Key Food Safety Principles

- Practice safe soil preparation prior to planting
- Practice safe garden maintenance during planting and growing of fruits/vegetables
- Practice safe harvest and post-harvest handling including:
  - Good personal hygiene
  - Time and temperature control
  - Cross-contamination prevention



# Good Agricultural Practices

**Gardening is fun and good for you!**

Keep it safe through every step

- Preparing the garden
- Maintaining the garden
- Harvesting the produce
- Storing the produce
- Preparing the produce



# Good Agricultural Practices

## Master Gardeners Role

- Spread the word to home gardeners!
- Where:
  - Fairs, Garden Shows, Clubs, etc.
- How:
  - Handouts, Display, PowerPoint presentation



# Questions ???

