Welcome to today’s topics!

- Basic food safety, microbiology and preservation
- Freezing produce for best quality

- Join us at our upcoming webinars
  - Wednesday, July 29: Let’s make jams, jellies and pickles
  - Wednesday, August 5: Let’s preserve tomatoes and salsa

If you have questions, please post them in the chat box and we will look at those questions at the end of the presentation.

Or, send emails directly to Julie.garden-robinson@ndsu.edu or contact your local Extension agent.

Special request

- You will be sent a link to a short survey. Please take it.
- If you watch a recording of this webinar, please take the online survey using the link provided.
- More than 50 field to fork recorded webinars are available at www.ag.ndsu.edu/fieldtofork

Raise your hand (using the hand icon by the participant list) if you have ever preserved food.

Acknowledgments

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Are your hands raised? We all preserve food on a daily basis.

Definitions

**Food Safety**

An interdisciplinary field of study that deals with the fundamental and practical nature of food safety hazards and the tools necessary to minimize the risk of foodborne illness.

Any process or step that reduces or prevents the deterioration of a food.

When you preserve food, you are a scientist!

Let’s walk through some terms.

How do we preserve foods?

- Thermal Treatment
- Cold Temperatures
- Osmotic Inhibition
- Chemicals
- Fermentation
- Irradiation
- High Pressure Processing
- Modified Atmospheric Packaging

Biological

Associated with live animals, humans and raw food products.

- **Examples:**
  - Bacteria
  - Parasites
  - Viruses
  - Fungi
  - Enzymes
- Most common cause of foodborne illness
- Primary target of food safety programs
**Chemical**

Toxic substances that occur naturally or unintentionally added during processing of food

- **Naturally occurring:**
  - Allergens
  - Toxins
- **Man-made chemicals:**
  - Agricultural chemicals
  - Cleaning and sanitizing compounds
  - Heavy metals
  - Food additives

**Physical**

Foreign object (hard or soft) that can cause illness or injury

- Commonly result from improper food handling or improper cleaning of raw materials

**Microorganisms are our greatest concern...**

because they can cause illnesses such as:

- **Infection**
  Eating foods containing live disease-causing microorganisms
- **Intoxication**
  Eating foods containing harmful chemicals or toxins
- **Toxin-mediated Infection**
  Eating foods containing harmful microorganisms that produce toxin once inside the intestinal tract of a human

Enzymes are a secondary concern because they affect quality

**Microorganisms are our greatest concern...**

Because they can cause illnesses.
WHAT TYPES OF MICROORGANISMS ARE OF GREATEST CONCERN?

Mold
Aerobic Microorganism (aerobic means in presence of oxygen)
- Moist environments preferred
- 68 to 95 ºF (20 to 35 ºC)
- pH of 2 to 8.5

Yeast
Predominantly aerobic microorganisms but can survive under anaerobic conditions
- Moist environments preferred
- 68 to 100 ºF (20 to 38 ºC)
- pH of 4 to 6.5

Bacteria
Microorganisms that survive under aerobic or anaerobic conditions or under both
- Require moist environments
- 68 to 122 ºF (20 to 50 ºC)
- pH of 4.5 to 7

Common Food Intoxications and Infections

<table>
<thead>
<tr>
<th>BACTERIA</th>
<th>CAUSE</th>
<th>SYMPTOMS/INFECTIONS</th>
<th>LIKELY SOURCES</th>
<th>PREVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clostridium food poisoning</td>
<td>Toxic produced by Clostridium perfringens</td>
<td>Diarrhea, stomach cramps, chills, headache</td>
<td>Meat, poultry, hot foods cooled to room temperature</td>
<td>Keep hot foods hot; refrigerate uneaten foods promptly</td>
</tr>
<tr>
<td>Staph poisoning</td>
<td>Toxic produced by Staphylococcus aureus</td>
<td>Severe vomiting, diarrhea and stomach cramps</td>
<td>Moist, cooked meat dishes or starchy foods cooled to room temperature</td>
<td>Refrigerate uneaten foods promptly</td>
</tr>
<tr>
<td>Botulism</td>
<td>Toxic produced by Clostridium botulinum</td>
<td>Nausea, vomiting, diarrhea, fatigue, double vision, muscle paralysis, respiratory failure</td>
<td>Low-acid, canned foods, honey</td>
<td>Boil home-canned foods; do not give honey to infants</td>
</tr>
<tr>
<td>Salmonellosis</td>
<td>Infection by Salmonella</td>
<td>Nausea, diarrhea, abdominal pain, headache, fever, weakness</td>
<td>Meat, poultry, egg, and milk products; cross-contamination</td>
<td>Cook food thoroughly; follow sanitation rules carefully</td>
</tr>
<tr>
<td>E.Coli poisoning</td>
<td>Infection by Escherichia coli 0157:H7</td>
<td>Diarrhea, stomach cramps, hemolytic uremic syndrome, kidney failure, and brain damage</td>
<td>Undercooked ground beef; unpasteurized milk; cross-contamination</td>
<td>Cook beef thoroughly; follow sanitation rules carefully</td>
</tr>
<tr>
<td>Listeriosis</td>
<td>Infection by Listeria monocytogenes</td>
<td>Fever, chills, nausea, loss of balance, miscarriage</td>
<td>Soft cheeses; RTE deli meats</td>
<td>Heat RTE meats to steaming; at risk population should avoid likely foods</td>
</tr>
</tbody>
</table>

Basics of Safe Home Preservation
High quality food is selected and prepared according to specific directions following a USDA tested recommendation.

Where applicable, food is placed in a canning or MASON-type jar with a 2-piece lid and is heated to a temperature that destroys microorganisms.
Heat inactivates enzymes that cause changes in:

- Color
- Flavor
- Texture

Air is driven from the jar during heating. As the jar cools, a vacuum seal is formed.

This helps:
- Holds the lid on the jar.
- Prevents recontamination of the food.
- Prevents air from drying out the food.

Dried/dehydrated food should be stored in airtight containers to minimize moisture uptake.

When called for, use the proper level of sugar or salt during the preservation process. (Salt is not required in pressure canning, though.)

Store frozen products should in plastic FREEZER bags with minimal headspace to prevent freezer burn.
Use Approved Methods Only

Foods are divided into two main categories:

- Those that contain acid
  - Called "acid foods"
- Those containing little to no acid
  - Called "low acid" foods

pH is the measure of acidity (scale of 0 to 14, with 7 as neutral)

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Acid Foods

pH < 4.6
- Generally all fruits, including jams and jellies
- Tomatoes and figs are borderline (specific amounts of citric acid or lemon juice must be added before canning to acidify)
- Sauerkraut
- Foods to which large amounts of acid are added (pickles)

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Low Acid Foods

pH > 4.6
- Generally all vegetables
- Meats
- Poultry
- Seafood
- Soups
- Mixtures of acid and low acid foods (spaghetti sauce – meat, vegetables and tomatoes)

Use a pH meter to evaluate the acidity of your food product.

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Freezing Fruit

Freezing fruit is one of the of the easiest methods of preserving food.

For best quality, use within 12 months and maintain freezer temperatures at 0 F or lower.

Most fruits can be frozen. Quality will vary depending on:
- Kind of fruit
- Stage of maturity
- Type of pack
Selecting Fruit

Select fruits by choosing those that are:
• Firm in texture
• Well-developed flavor

After selecting, wash small quantities at a time and avoid brushing.

Do NOT let the fruit soak.

Discoloration Prevention

Darkening naturally occurs during preparation and thawing of fruits such as:
• Apples, apricots, peaches, nectarines and pears

Ways to prevent darkening include:
• Ascorbic acid
• Lemon juice or citric acid
• Steaming

Method used depends on the type of fruit pack.

Choosing a Pack

There are several types of fruit packs suitable for freezing:
• Syrup pack
• Unsweetened pack
• Sugar pack
• Dry pack
• Tray pack
• Sugar replacement pack

Leave appropriate head space regardless of the pack style you choose.

Head Space

Methods of Packing Fruits

• Syrup pack
  – Syrup (40% solution recommended) is used to cover prepared fruit completely and frozen.

Methods of Packing Fruits

• Pectin pack
  – Used for berries, cherries and peaches. Less sugar is needed, and fresh-fruit flavor, color and texture are retained.

• Unsweetened pack
  – Fruit covered in water containing ascorbic acid or juice. Fruit generally yields lower quality product than those packed with sugar.

• Sugar pack
  – Sugar is sprinkled over fruit and mixed until juice is drawn out and sugar is dissolved. Fruits like peaches, strawberries, plums and cherries yield sufficient syrup.
Methods of Packing Fruits

- **Dry pack**
  - Good for small, whole fruits, such as berries. Pack prepared fruit into a container, seal and freeze.

- **Tray pack**
  - Good for unsweetened pack. A single layer of fruit is spread out on shallow tray and allowed to freeze. Once frozen, it’s packed in freezer bags and frozen again.

- **Sugar replacement pack**
  - Non-nutritive sweeteners, such as aspartame, can be used when freezing fruits. Give a sweet taste but not furnish beneficial effects of fruit. Will freeze harder than sugar packs.

Packing

Choose containers made for freezer storage

- And label with contents and date
- Moisture-vapor resistant
- Durable
- Leak-proof

This helps to keep moisture in and air out.

Loss of moisture = freezer burn.

Thawing

Allow fruit to thaw in unopened package.

- Fruits packed in dry sugar thaw faster than those in syrup
- Fruits without sugar take longer
- Upon standing, fruit will become flabby and darken

Fruits used in salads, shortcakes, fruit sauces and cups should be partially thawed.

For pies, thaw until fruit can be separated.

To Learn More

To learn more about how to freeze your fruit, please visit: https://www.ag.ndsu.edu/publications/food-nutrition/freezing-fruits-1/fn182.pdf

Freezing Vegetables

Fresh, tender vegetables right from the garden are best for freezing.

If they cannot be frozen immediately, store in refrigerator to preserve freshness until they can be prepared and frozen.

Vegetables like: cabbage, green onions, lettuce and salad greens, radishes, cucumbers, potatoes and tomatoes do not freeze well.
Containers for Freezing

Choose containers made for freezer storage and:
• Label with contents and date
• Are moisture-vapor resistant
• Durable
• Leak-proof

Preserves the quality of the vegetable by keeping moisture in and air out.

Loss of moisture = freezer burn

Blanching

Is the scalding the vegetables in water or steam for a short period of time.
• Very important step
• Slows down (or stops) enzymatic action
  – If enzymatic action isn’t stopped, vegetable may discolor and toughen resulting in unappetizing veggies.
• Brightens color
• Prevents loss of nutrients

Blanching time varies with the size and type of vegetable.

Blanching Times

Blanching can occur three ways:
• In boiling water (with a blanching basket and cover (blancher))
• Using steam (with kettle and wire basket or cheese cloth)
• In a microwave
  – Not as effective
  – Research has found some enzymes remain active and results in
    • Off-flavors
    • Loss of texture
    • Loss of color

Methods of Packing Vegetables

If using rigid containers, leave half-inch head space.
• Food expands when frozen

If using freezer bags, press out the air of the unfilled part of the bag, seal and freeze.

Cooling

After heated, vegetables should be cooled quickly to stop the cooking.
• Plunge basket of vegetables immediately into a large amount of cold water
• Change water frequently
  – Or use cold running water or iced water

If ice is used, you’ll need 1 pound of ice per pound of vegetables.
Methods of Packing Vegetables

- **Solid pack**
  - Drained vegetables placed in freezer containers

- **Loose pack**
  - Single layer placed on tray to freeze. Once frozen, placed in container or bag and returned to freezer

- **Dry pack**
  - After blanched, cooled and drained, vegetables are packed and frozen immediately.

- **Tray pack**
  - After blanched, cooled and drained, a single layer of veggies are placed on a tray to freeze, packaged quickly once frozen and placed back in freezer.

How to Use Frozen Vegetables

- **Most frozen vegetables should be cooked without thawing.**
  - Corn on the cob is the exception (partial thaw before cooking)

- **Cook vegetables until tender**
  - Blanching partially cooks vegetables prior to freezing
  - Less cooking time is required.
  - Cook in small amount of water or use steam.

- A microwave oven is excellent for cooking frozen vegetables.

To Learn More

To learn more about freezing vegetables, please visit: [https://www.ag.ndsu.edu/publications/food-nutrition/freezing-vegetables/fn187.pdf](https://www.ag.ndsu.edu/publications/food-nutrition/freezing-vegetables/fn187.pdf)

Visit [www.ag.ndsu.edu/food](http://www.ag.ndsu.edu/food) and click on Food Preservation for a wide range of handouts and other information.

See [www.ag.ndsu.edu/fieldtofork](http://www.ag.ndsu.edu/fieldtofork) for more information.

Upcoming Webinars

Questions?

Please email julie.garden-robinson@ndsu.edu or contact your local office of NDSU Extension to learn more.