**Why Preserve Food**

- Enjoy produce all year
- Fresh food flavor
- Food on hand
- Control salt/sugar
- Sense of satisfaction

**Handle Food Safely!**

Prevent pathogens from spreading:

1. Wash hands for 20 seconds
2. Clean and sanitize work surfaces and equipment
   * 1 teaspoon unscented chlorine bleach per gallon of water
3. Wash all produce

**Successful Preserving**

1. Use good equipment made for home preservation.
2. Use research-tested recipes published *after* 2014!
3. Follow guidelines for preparation, jar size, preserving method, and processing time.

**Preservation Resources**

**Books:**
- Download PDF at [http://nchfp.uga.edu/index.html](http://nchfp.uga.edu/index.html)

**Preservation Resources Continued**

**Websites:**
- Ball at [http://www.freshpreserving.com](http://www.freshpreserving.com)
- National Center for Home Food Preservation at [http://www.uga.edu/nchfp](http://www.uga.edu/nchfp)
- University of Wyoming Extension Nutrition & Food Safety Website at [https://uwyoextension.org/uwnutrition/category/food-preservation](https://uwyoextension.org/uwnutrition/category/food-preservation)
- University of Wyoming Extension Nutrition & Food Safety Facebook page videos at [https://www.facebook.com/UWEnutrition](https://www.facebook.com/UWEnutrition)
Freezing Produce

Advantages of Freezing

- Many foods can be frozen
- Simple procedures
- Not time consuming
- Quantity for your needs
- Retention of color, flavor, nutritive value

Disadvantages of Freezing

- Investment cost of freezer and maintenance
- Space limited by capacity of freezer
- Texture of some food may be undesirable
- Produce softer when frozen and thawed

Freezing Tips

Freezing only slows enzyme activity (chemical reactions lead to food deterioration)

Freezing Containers

1. Rigid plastic or glass
2. Flexible freezer bags
3. Moisture-vapor resistant wrapping
   - Plastic freezer wrap
   - Freezer paper
   - Heavy-weight aluminum foil

Headspace

Allow for expansion during freezing in containers.

<table>
<thead>
<tr>
<th>Type of Pack</th>
<th>Container with wide top opening</th>
<th>Container with narrow top opening</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pint</td>
<td>Quart</td>
</tr>
<tr>
<td>Liquid Pack*</td>
<td>½ inch</td>
<td>1 inch</td>
</tr>
<tr>
<td>Dry Pack**</td>
<td>½ inch</td>
<td>1 inch</td>
</tr>
<tr>
<td>Juices</td>
<td>⅜ inch</td>
<td>1¼ inch</td>
</tr>
</tbody>
</table>
Do Not Freeze

<table>
<thead>
<tr>
<th>Do Not Freeze</th>
<th>Frozen for Short Time</th>
<th>Frozen for Long Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabbage</td>
<td>Limp, water-logged, quickly develops oxidized color, aroma and flavor</td>
<td>Limp, water-logged, it becomes mushy</td>
</tr>
<tr>
<td>Celery</td>
<td>Limp, water-logged, it becomes mushy</td>
<td>Limp, water-logged, it becomes mushy</td>
</tr>
<tr>
<td>Cress</td>
<td>Limp, water-logged, it becomes mushy</td>
<td>Limp, water-logged, it becomes mushy</td>
</tr>
<tr>
<td>Cucumbers*</td>
<td>Limp, water-logged, it becomes mushy</td>
<td>Limp, water-logged, it becomes mushy</td>
</tr>
<tr>
<td>Endive</td>
<td>Limp, water-logged, it becomes mushy</td>
<td>Limp, water-logged, it becomes mushy</td>
</tr>
<tr>
<td>Lettuce</td>
<td>Limp, water-logged, it becomes mushy</td>
<td>Limp, water-logged, it becomes mushy</td>
</tr>
<tr>
<td>Parsley</td>
<td>Limp, water-logged, it becomes mushy</td>
<td>Limp, water-logged, it becomes mushy</td>
</tr>
<tr>
<td>Radishes</td>
<td>Limp, water-logged, it becomes mushy</td>
<td>Limp, water-logged, it becomes mushy</td>
</tr>
<tr>
<td>Irish potatoes</td>
<td>Soft, crumbly, mealy</td>
<td>Soft, crumbly, mealy</td>
</tr>
<tr>
<td>Baked or boiled potatoes</td>
<td>Soft, crumbly, mealy</td>
<td>Soft, crumbly, mealy</td>
</tr>
<tr>
<td>Cooked macaroni, spaghetti or rice</td>
<td>Mushy, tastes warmed over</td>
<td>Mushy, tastes warmed over</td>
</tr>
<tr>
<td>Egg whites</td>
<td>Soft, tough, rubbery, spongy</td>
<td>Soft, tough, rubbery, spongy</td>
</tr>
<tr>
<td>Meringue</td>
<td>Soft, tough, rubbery, spongy</td>
<td>Soft, tough, rubbery, spongy</td>
</tr>
<tr>
<td>Icings</td>
<td>Frothy, weeps</td>
<td>Separates, watery, lumpy</td>
</tr>
<tr>
<td>Cream or custard fillings</td>
<td>Separates, watery, lumpy</td>
<td>Separates, watery, lumpy</td>
</tr>
<tr>
<td>Milk sauces</td>
<td>May curdle or separate</td>
<td>May curdle or separate</td>
</tr>
<tr>
<td>Sour cream</td>
<td>Separates, watery</td>
<td>Separates, watery</td>
</tr>
<tr>
<td>Cheese or crumb toppings</td>
<td>Soggy</td>
<td>Soggy</td>
</tr>
<tr>
<td>Mayonnaise or salad dressing on sandwich</td>
<td>Separates</td>
<td>Separates</td>
</tr>
<tr>
<td>Fruit jelly on sandwich</td>
<td>May soak bread</td>
<td>May soak bread</td>
</tr>
<tr>
<td>Fried foods</td>
<td>Lose crispness, become soggy</td>
<td>Lose crispness, become soggy</td>
</tr>
</tbody>
</table>

* Cucumbers and cabbage can be frozen as marinated products such as “freezer slaw” or “freezer pickles.” These do not have the same texture as regular slaw or pickles.

Freezing Effect on Spices and Seasonings

- Pepper, clove, garlic, green pepper, some herbs get strong and bitter
- Onion and paprika change flavor
- Celery seasonings become stronger
- Salt loses flavor; may increase rancidity if fat is present in item
- Add additional seasoning when reheat/serve

Freezing Tips

- Most vegetables blanched
  - Scalding vegetables in boiling water or steam for a short time
  - Time: 10 seconds to 11 min
- Underblanching stimulates the activity of enzymes and is worse than no blanching!
- Stop cooking with ice water bath

Freezing Tips Continued

- Choose high quality produce
- Freeze promptly
  - In advance, set freezer to -10°F
- Follow procedures of research-tested recipes

Freezing Tips Continued

- Use freezer packaging
  - Keep air out!
- Do not overload freezer
  - 2-3 lbs. food per cubic foot
- Spread out packages, then stack
- Allow for headspace
- Label containers: name, date, quantity amount
Length of Storage

<table>
<thead>
<tr>
<th>Food</th>
<th>Approximate months of storage at 0°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits and Vegetables</td>
<td>8 - 12</td>
</tr>
<tr>
<td>Poultry</td>
<td>6 - 9</td>
</tr>
<tr>
<td>Fish</td>
<td>3 - 6</td>
</tr>
<tr>
<td>Ground Meat</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Cured or Processed Meat</td>
<td>1 - 2</td>
</tr>
</tbody>
</table>

Drying Produce

Advantages of Drying
- Many foods can be dried
- Store more food in less space
- Better flavor and retains nutritional quality
- Simple and easy
- Use dehydrator, oven, microwave, or air

Disadvantages of Drying
- Investment cost of equipment
- Food is darker, more brittle, and less flavorful
- Hours required to dry foods

How Drying Preserves
- **HEAT**: removes moisture, doesn’t cook
- **DRY AIR**: absorbs moisture
- **AIR CIRCULATION**: carries away moisture
- Inhibits bacteria, yeast, and mold growth
- Prevents food spoilage
- SLOWS down enzyme activity - doesn’t inactivate
Factors of Successful Drying

Surface Area
* Larger surface = more rapid drying

Temperature
* Hotter temp = shorter drying time

Air Movement
* Moving air = faster drying

Humidity
* Dry air = quick drying

Preparing Food

• Use high-quality, firm, ripe produce
• Wash produce
• Pre-treat, if necessary
• Thin, uniform slices

Drying Methods

Indoor Air

Microwave

Oven

Dehydrator

Indoor Air Drying

• Hot peppers and nuts
• Best for herbs
  * Bud bursting stage
  * Wash and dry
• Hang herbs in small bundles
  * Use paper bags (with holes) to catch leaves that may drop
  * lavender, rosemary, sage, thyme

Microwave Drying

• Only herbs
  * Ineffective air circulation
  * Food cooks before dries
  * High temps cause flavor loss
  * celery leaves, parsley, sage, thyme

Oven Drying

• Best for fruits, herbs, seeds, tomatoes
• Place food in single layer on cookie sheets
• Oven temp range is 120 - 150°F
  * Higher temps cook not dry!
  * New ovens won’t go low
• Can take twice as long as a dehydrator if no oven fan
Dehydrator Drying

<table>
<thead>
<tr>
<th>Horizontal Air Flow</th>
<th>Vertical Air Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduces flavor mixing</td>
<td>Flavors can mix</td>
</tr>
<tr>
<td>Equal heat dispersal</td>
<td>Uneven heat dispersal</td>
</tr>
<tr>
<td>No drips onto heating unit</td>
<td>Dripping onto heating unit</td>
</tr>
<tr>
<td>Less limit on height of food</td>
<td>Removing cover may stop heating</td>
</tr>
</tbody>
</table>

Dehydrator Drying Continued

<table>
<thead>
<tr>
<th>Do</th>
<th>Don’t</th>
</tr>
</thead>
<tbody>
<tr>
<td>High wattage heater</td>
<td>Single wall construction</td>
</tr>
<tr>
<td>Strong fan</td>
<td>Exposed heating element</td>
</tr>
<tr>
<td>Enclosed thermostat</td>
<td>Clear plastic lids or trays</td>
</tr>
<tr>
<td>Temperature dial from 85-160°F</td>
<td>Overload</td>
</tr>
<tr>
<td>Auto shut-off timer</td>
<td></td>
</tr>
<tr>
<td>UL seal of approval</td>
<td></td>
</tr>
<tr>
<td>Guarantee</td>
<td></td>
</tr>
<tr>
<td>Jerky: Excalibur and Gardenmaster</td>
<td></td>
</tr>
</tbody>
</table>

Drying Temperatures

- Herbs, nuts, seeds: 90-100°F
- Fruits/Vegetables: 130-140°F
- Meat/Fish: 160°F
- Avoid “case hardening” – dry outside and moisture inside = mold

Preparing Fruit

- Read and follow recipe directions!
- Wash and dry fruit
- Peel and core
- Whole, halved, sliced
  - Thin, uniform slices
- If drying whole fruit, crack the skin to speed drying
  - cranberries

Pre-treating Fruit

- Pre-treat fruits to prevent darkening:
  - ascorbic acid (vit C)
  - citric acid powder mix
  - 100% fruit juice - lemon, orange, pineapple
  - honey dip (higher in calories)
  - syrup blanching (candied fruit)
  - food grade sulfuring or sulfite dip (check allergies)

Drying Fruit

- Similar thickness in single layer (no touching) on trays
- Drying times are approximate
- Watch food since dries much faster at end of drying period
Determine Fruit Dryness

- Dry until SOFT/PLIABLE, not sticky/tacky (20% moisture)
- Test for dryness by cutting several cooled pieces in half
  - No visible moisture
  - No moisture squeezed from fruit
  - A piece folded in half doesn’t stick together
  - Berries rattle when shaken

Cool and Package Fruit

- After drying, cool 30-60 minutes and before packaging
  - Packaging warm food = sweating/moisture buildup
  - Packaging delays = moisture absorption
- Use canning jars, vacuum sealed containers, or aluminum containers

Dried Fruit Pasteurization

Sun dried fruits and vine dried beans: kill insects and their eggs

FREEZER METHOD:
Freeze food in freezer containers at 0°F for at least 48 hours.

OVEN METHOD:
Place food in single layer on tray. Place in 160°F preheated oven for 30 minutes.

After either of these treatments, the dried fruits are ready to be conditioned and stored.

Condition Fruits

- CONDITION fruits to distribute and equalize moisture to reduce risk of mold growth
  - Pack fruit loose in plastic or glass jar, seal, and let stand 1 week or up to 10 days
  - Shake jars daily to separate pieces
  - If condensation appears, place fruit back in the dehydrator

Drying Vegetables

- Dry veggies immediately after harvesting
- Only prepare as much as can be dried at one time
  - Holding after prepared = loss of quality/nutrients
- Read and follow recipe directions!
- Wash and dry veggies
- Trim, core, peel, cut, slice, or shred as directed
- Small, uniform pieces

Blanching Vegetables

- Most veggies should be blanched before drying
  - Heating veggies to destroy enzyme action
    - loss of color and flavor
  - Don’t blanch, green peppers, mushrooms, onions

WATER METHOD:
Veggies submerged in water
Less time to blanch
Time once water returns to boil
More nutrient loss

STEAM METHOD:
Veggies above 2” water
More time to blanch
Heated – not cooked
Less nutrient loss
Cooling Vegetables

- Dip veggies in cold water to stop cooking
- Drain water
- Similar thickness in single layer on drying trays
- Wipe off excess water
- Place in dehydrator or oven

Determine Vegetable Dryness

- Dry until BRITTLE/CRISP or LEATHERY (10% moisture)
  - It is better to over-dry than under-dry
- Cool 30-60 minutes and package
  - Canning jars, vacuum sealed containers, aluminum containers
- Do not need to condition vegetables – low moisture

Leathers/Rolls

- Puree produce
- Pour 1/8-inch thick on tray
- Dry when no indentation in center of leather
- When warm, peel up and roll, cool, wrap in plastic
- Keep one month or freeze

Try vegetable leathers (pumpkin, tomato, mixed veggie, etc.)

Add spices, flavorings, and other additions (coconut, nuts, granola, seeds, etc.)

Drying Meat for Jerky

- Lean meat
  - Beef, fish, lamb, pork, smoked poultry – not raw, venison, wild game
- Treat wild game to kill trichinella parasite
  - Freeze a portion 6 inches or less thick at 0°F or below for at least 30 days
  - Will not eliminate bacteria from meat

Meat Prep

- Partially freeze meat for easier slicing
- Slice meat no thicker than 1/4 inch
  - Chewy – slice with grain
  - Tender – slice across grain
- Trim and discard all fat

Drying Jerky

- Dry until CRACKS (not break) when bent
- Pat off oil/fat
- Cool
3 Jerky Options

1. Vinegar Marinade
   * Soak meat in vinegar
   * Destroys Salmonella and E. Coli, not Trichinella parasites

2. Hot Pickle Cure
   * Pre-cook meat dipped in hot brine

3. Post-Drying Heating
   * Cook dried meat at 275°F 10 min
   \textit{Internal temp of jerky reached 160°F!}

Storing Jerky

- Room temp for 2 weeks in sealed container
- Check for weeping – discard if evident
  * Moisture or fat on surface of jerky
- Increase shelf life by:
  * Refrigeration
  * Freezing

Drying Tips

- Very light oil spray on tray to prevent sticking
- Uniform size pieces in single layer
- Use proper temp and time
- Follow directions for drying method
- Test for dryness
- Pack and store as recommended – cool, dark spot
- For best quality use within 6 month to 1 year
- If mold, discard food!