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Cooperative Extension

**Master  
Food  
Preserver**

# Dehydrating for Backpacking



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# Mission Statement

“To extend *research-based* knowledge and information on safe home food preservation methods to the residents of California.”



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# Agenda

- Why dehydration?
- Drying Methods
- What to Dry or Not to Dry
- Ingredient Method
- Whole Meal Method
- Portioning and Packaging
- Rehydration



# Why dry?

- Simple
- Minimal equipment, supplies, and ingredients
- Reduces size and weight of food
- Long shelf life
- Requires little space
- Provides more options for special diets and preferences than store bought backpacking food



# How does drying preserve?

- Microorganisms (yeast, mold, bacteria) need water to grow, so removing moisture prevents spoilage from microorganisms.
  - Concerns with jerky and foodborne illness
- Enzyme action is slowed (though not stopped), which means that color, texture, and quality do not degrade as rapidly once food is dried.



# Choose a drying method

- Air circulation
  - Moving air encourages evaporation by maintaining low humidity
- Temperature
  - 140°F ideal for many foods
  - Too slow (low temp., poor air circ.)=microorganisms could grow
  - Too fast (high temp., rapid air circ.)=cooked food or “case hardening”

“Case hardening” is when the outside dries but moisture is trapped inside, resulting in mold.



# Methods

Sun

Solar

Vine

Room

Oven

- Oven which registers 140°F- 150°F, Fan for air movement
- Relatively low cost/high energy use, ties up oven
- 2x longer

Dehydrator

- Easy settings
- Variety of prices



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# Dehydrator features to look for

- Double wall
- Metal or high grade plastic (not wood)
- Enclosed heating element
- Counter-top design
- Enclosed thermostat
- Dial to regulate temperature
- Auto shut-off timer
- Fan or blower
- Plastic, sturdy, washable mesh trays





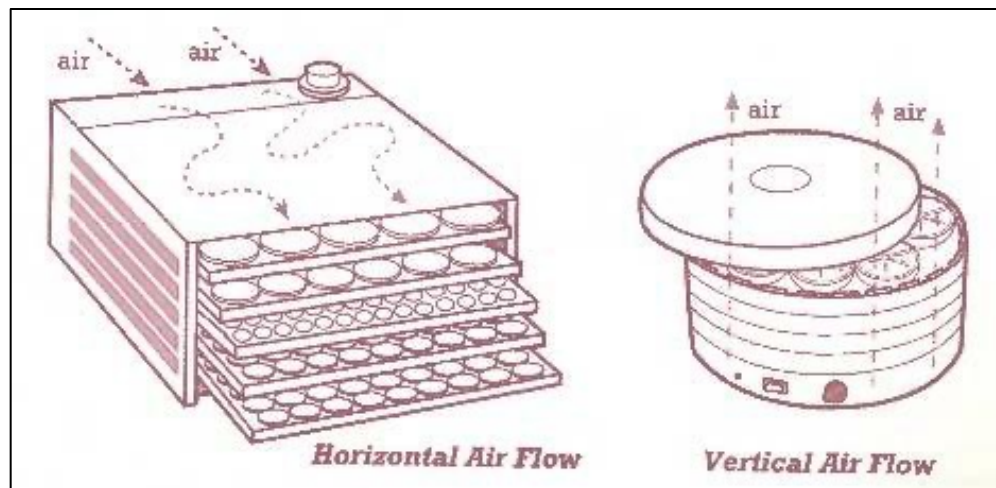
# Differences among dehydrators

Horizontal air flow- heat & fan on side

- Reduces flavor mixing
- Equal heat dispersal
- No dripping onto heating element
- Limit on height of food pieces

Vertical air flow- heat & fan in base/lid

- Flavors might mix
- Uneven heat dispersal unless trays rotated
- Liquids might drip onto heating element; choose fan in lid



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**Cook Separate, Dehydrate then Assemble**  
**VS**  
**Cook the Whole Meal then Dehydrate**  
**VS**  
**Hybrid Method**



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# What food products can you dry ?

- Fruits
- Vegetables
- Leathers
- Jerky/ meat
- Herbs
- Nuts and seeds



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# Things that are a problem to dry?

- Dairy and eggs
- Fats or high fat foods
- avocados, olives, pomegranates, and many citrus fruits.
- Broccoli, lettuce
- Poultry



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# Fruits: Preparation

- Wash
- Core if needed
- Uniform pieces- whole, halved, or sliced
- Peeled and thinly sliced dries fastest
- “Check” whole fruits with thick skins (e.g. cranberries)
  - Place in boiling water until skin cracks, then quickly place into cold water to prevent cooking



# Fruits: Pre-treatment

To prevent immediate and long-term darkening

- Sulfuring
- Sulfite dip
- Ascorbic acid
- Ascorbic acid mixtures
- Fruit juice dip
- Honey dip
- Syrup blanching
- Steam blanching



# Ascorbic acid

## Ascorbic acid

- For 2 cups water, add 1 tsp
- Soak 3 to 5 minutes and drain

## Ascorbic acid mixtures

- For 1 quart water, add 1 to 1.5 tsp
- Soak 3-5 minutes and drain



# Flavor (and calories) added: Dips

## Fruit juice dip

- Choose juice high in vitamin C (orange, lemon, pineapple, grape, or cranberry)
- Soak 3 to 5 minutes, drain

## Honey dip

- To 1½ cups boiling water, add and mix ½ cups sugar
- Cool, then add ½ cups honey
- Soak 3 to 5 minutes, drain





# Blanching

## Syrup blanching

- Boil 2 cups water, 1 cup sugar, and 1 cup light corn syrup
- Add 1 pound fruit
- Simmer 10 minutes
- Remove from heat and let stand 30 minutes
- Rinse lightly and drain

## Steam blanching

- Boil water, lower fruit according to blanching times



# Fruits: Drying

- Single layer
- Follow directions and drying times provided
- Watch food carefully at the end
  - Dries much faster
- Dry until doesn't stick or have any visible moisture
  - Tests: fold in half, squeeze
  - Can dry to crispy if you are making a fruit chip
- No more than 20% of original moisture should remain for storage



# Fruits: Conditioning

- Cool 30 to 60 minutes
  - Packaging too soon = too much moisture could be retained
  - Too late = moisture could be picked-up
- Condition to equalize
  - Seal in container for 7 to 10 days, shaking occasionally
  - If you see condensation, dry some more
- Store in dry, moisture-proof containers



# Vegetables: Preparation

- Select freshly picked, high quality veggies
- Wash
- Trim and peel as needed
- Make pieces uniform
- What benefits from being fully cooked



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# Vegetables: Pretreating to inactivate enzymes

## Water blanching

- Fill large pot 2/3 with water
- Bring to boil, then submerge veggies in a basket or colander
- Start timer (refer to blanching time table) when water returns to a boil
- If it takes more than one minute to come to a boil, then there are too many veggies...reduce amount next time
- Dip veggies in cold water quickly– until just slightly hot – to stop cooking
- Pat veggies dry and place in on tray



# Vegetables: Pretreating to inactivate enzymes

## Steam blanching

- Add water to large pot, only so full that the steamer basket will not touch the water
- Bring to boil, then place veggies in the basket
- Cover with lid and steam according to time given in directions
- Dip veggies in cold water quickly – until just slightly hot – to stop cooking
- Pat veggies dry and place in on tray



# Vegetables: Drying

- Dry until brittle or crisp
  - Some vegetables shatter if hit with a hammer
- Store in airtight containers with no more than 10% of original moisture
- Lower moisture content results in no need for conditioning



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# Fruit and vegetable leathers

- Fun way to mix flavors (ex: banana blueberry)
- Can use fresh, canned or frozen fruits
- Can also use tomatoes, pumpkin puree, or mixed vegetables (tomato, onion, celery, potato)



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# Leathers: Preparation

- Wash fruit
- Peel if needed, and cut into small pieces
- Add lemon juice or ascorbic acid to prevent browning of light colored fruit
  - 2 tsp. lemon juice or 1/8 tsp. ascorbic acid per 2 cups fruit
- Purée until smooth
- Add sugar, honey, or corn syrup if desired



# Leathers: Drying

- Line cookie sheet with plastic wrap or use dehydrator tray insert
- Pour 1/8 inch thick, individual or large
- Dry at 140°F for 4-6 hours (individual) or 6-8 hours (large)
  - Up to 18 hours in an oven
  - 1 to 2 days in the sun
- Dry until no indentation from touch in center
- Roll in plastic wrap and store in moisture-proof container for up to one month at room temperature



# Key to success in drying meat

- Use lean meats (excess oil and fat causes meat to go bad)
- Can add breadcrumbs to ground meats while browning to help them absorb water later
- Use canned or pressure-cooked chicken
- Slice cooked meats thinly (lunch meats work great)
- Dehydrate meats separately from other ingredients for best results (meat needs higher temp. 140 degrees)



# Jerky: Preparation

- Use lean meat (beef, pork, venison, smoked turkey breast)
- Slice meat to ¼ inch thick
- Place in pan with marinade and let sit 1-2 hours or overnight
- For wild game, treat to kill *Trichinella* parasite by freezing piece no more than 6 inches thick at 0°F for at least 30 days
- Treat pork by freezing piece no more than 6 inches thick at 5°F for 20 days
- Heating is necessary to eliminate *E. coli* O157:H7 risk
  - Heat jerky to 160°F using prescribed methods for pre- or post-drying
  - Eating jerky only dried at 140°F (or below) may pose bacterial risk



# Jerky: Heating

## Heat prior to drying

- Refrigerate strips in marinade
- Boil strips in marinade for 5 minutes
  - If possible, check temp. of thickest strips with metal stem-type thermometer to make sure they are 160°F
- Drain
- Place in dehydrator preheated to 140°F



# Jerky: Heating

## Heat after drying

- Preheat oven to 275°F
- Place dried strips on cookie sheet, not overlapping
- Heat at least 10 minutes
- Check temperature (160°F) of thickest strips with metal stem-type thermometer



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# Jerky: Drying

- Do not dry outside
- Marinate
- Dry at 140°F
- Dry when cracks, but does not break when cool
  - Like bending a green stick vs a dry stick
- Pat off any oils
- Store jerky in sealed container at room temperature for 2 weeks or refrigerate/freeze for longer shelf life



# Ground Meat

- Can make hard pebbles
- Extra time to rehydrate
- Adding bread vs boiling method
- Sausage and ground pork – high fat content



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# Poultry & Fish

- Poultry
  - Don't use regular cooked chicken
  - Canned or pressure cooked chicken
- Fish
  - Low fat content
  - Water (not oil) packed cans



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# Pasta and Grains

- Why precook?
- 135 °F - 8-12 hours
- Or already precooked such as couscous, ramen, rice noodles



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# Dairy and Eggs- Yes or no?

- Yogurt and cottage cheese ( 1-2% fat)
- Ghee/Clarified butter – already low moisture no need to dehydrate ( don't use wet utensils to scoop)
- Milk – not ideal as takes a lot of energy
- Eggs – not ideal. 10-11% fat, higher risk of salmonella



# Condiments

- Salt and pepper (packets or small container)
- Oil in small bottles or packets
- Ghee packets
- Soy sauce packets
- Hot sauce



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# Cooking a Whole Meal

## Rules to Follow:

- Use only trimmed, lean meats
  - no sausage, bacon, etc.
- Chicken should be very soft
  - canned, pressure-cooked and finely shredded
- Use low sodium broths, tomato sauce, salsa, etc.  
(sauces become concentrated)
- No dairy (not suitable for long-term storage)
- **Remember:** ghee, oil, toppings, and condiments can be packaged with the meal and added on the trail to return fat, enhance flavor, and add texture.
- **Think “Thick”** - You may want to use less water or broth than usual in recipes, or reduce (cook on low for a long time) soups and stews to thicken them before dehydrating. Partially blend soups that contain starchy vegetables like squash and potatoes with a food processor to help thicken them up and make them dehydrator-friendly.



# Hybrid Option

If meat and vegetables are dehydrated together it is harder to rehydrate

- Dehydrate by types
- Fruits and vegetables at 135°F
- Grains and pasta 135°F
- Meats at 140°F ( with internal temp at 160°F)
- Rehydrate and mix on the trail



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# Portioning and Packing

- Average Amounts
  - 100 gram meal - average hiker, and
  - 150 gram meal - large or very hungry hiker.
- Calories vary by activity level, age, and body type
- Aim for a ratio of  $\frac{1}{3}$  protein,  $\frac{1}{3}$  starch, and  $\frac{1}{3}$  sauce/vegetables, etc. for a total of about 100-150 grams
- Package condiment packets or anything extra to go with each serving separately
- Zipper bags, vacuum sealing, and mylar



# Rehydrating

- Dehydrated meals generally require equal parts water to food and about 15–25 minutes to reconstitute.
  - Soak, Simmer, Rest
  - Boil, Rest
- Pot vs cook in bag





# Cozys/Kozzies

You can buy one or make one from Reflectix ( or a car sunshade)

- No need for simmering
- Saves fuel
- Can use a simpler and less expensive stove
- Eat right from the pot
- Food will stay warmer for longer



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# Questions?



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