Food Preservation: where to start?

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Food Preservation

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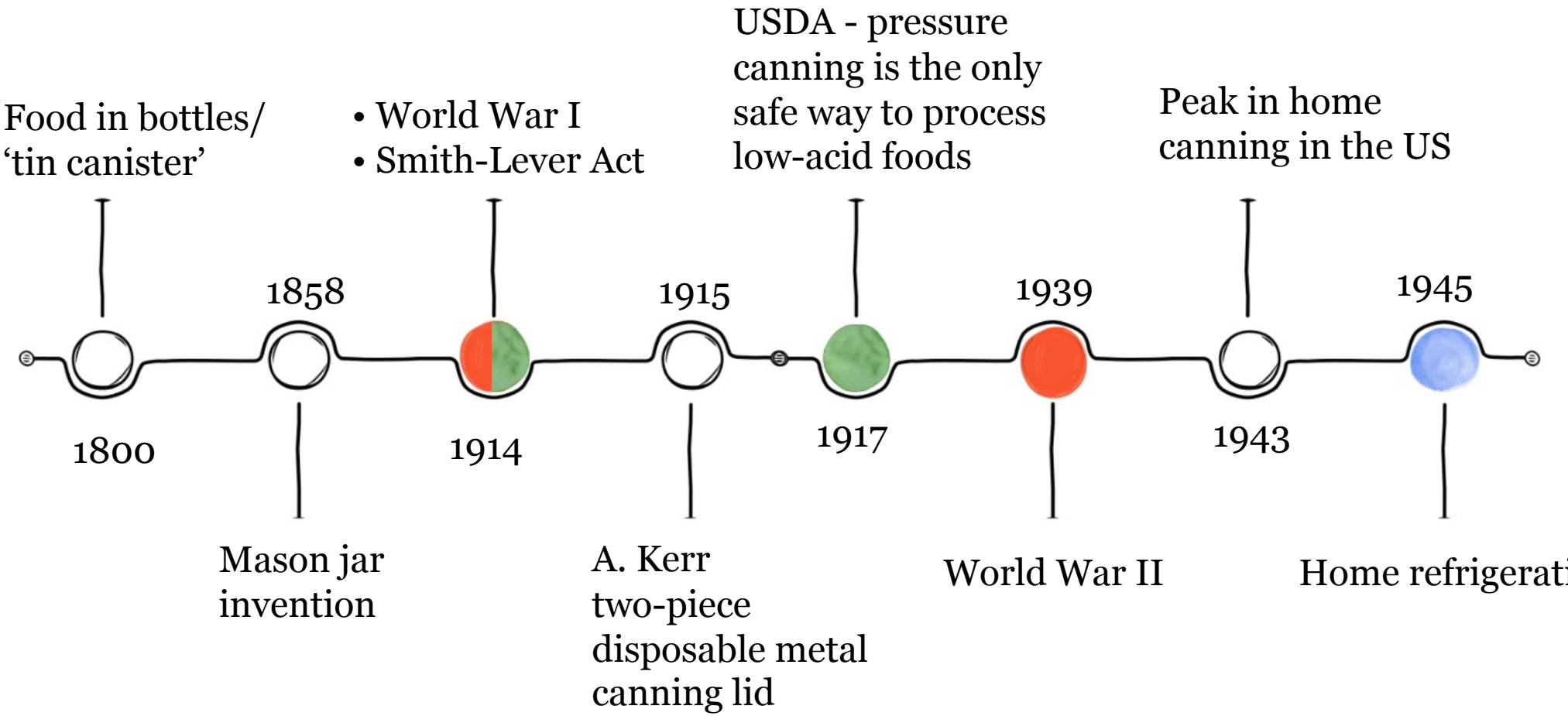
Home Canning History



USDA, 2022

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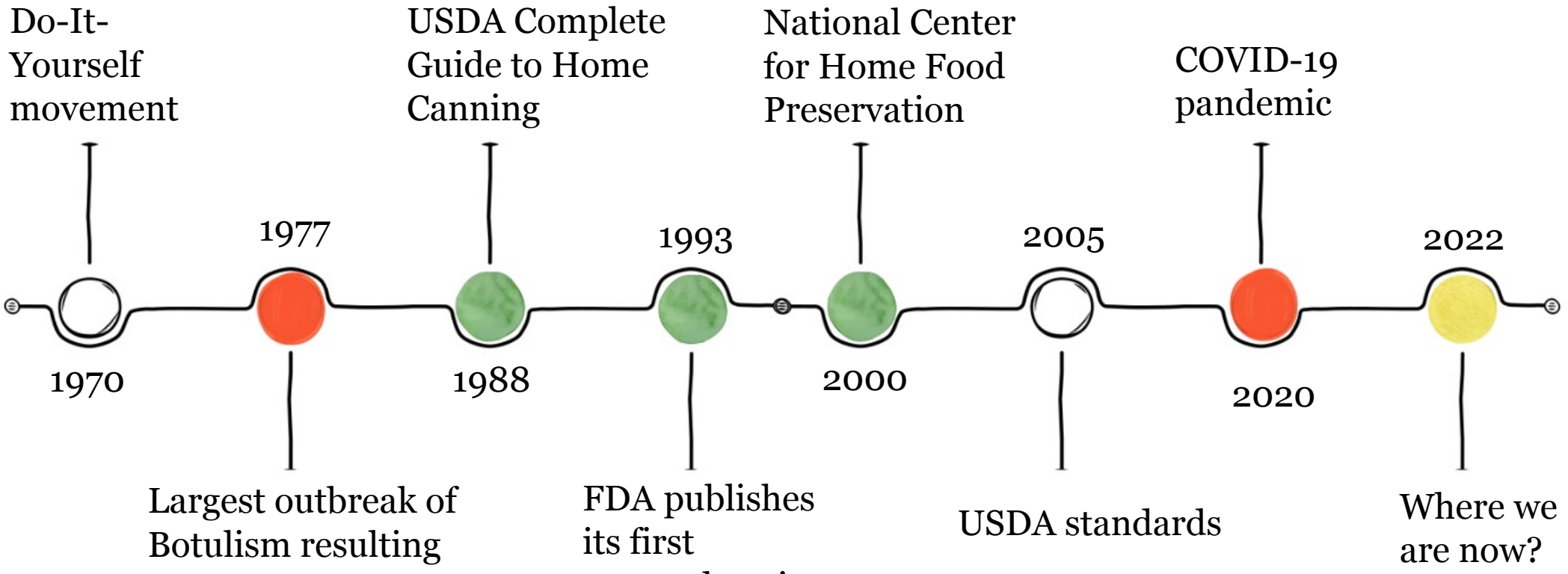
Home Canning History



USDA, 2022; Date et al., 2011

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Why preserve food?

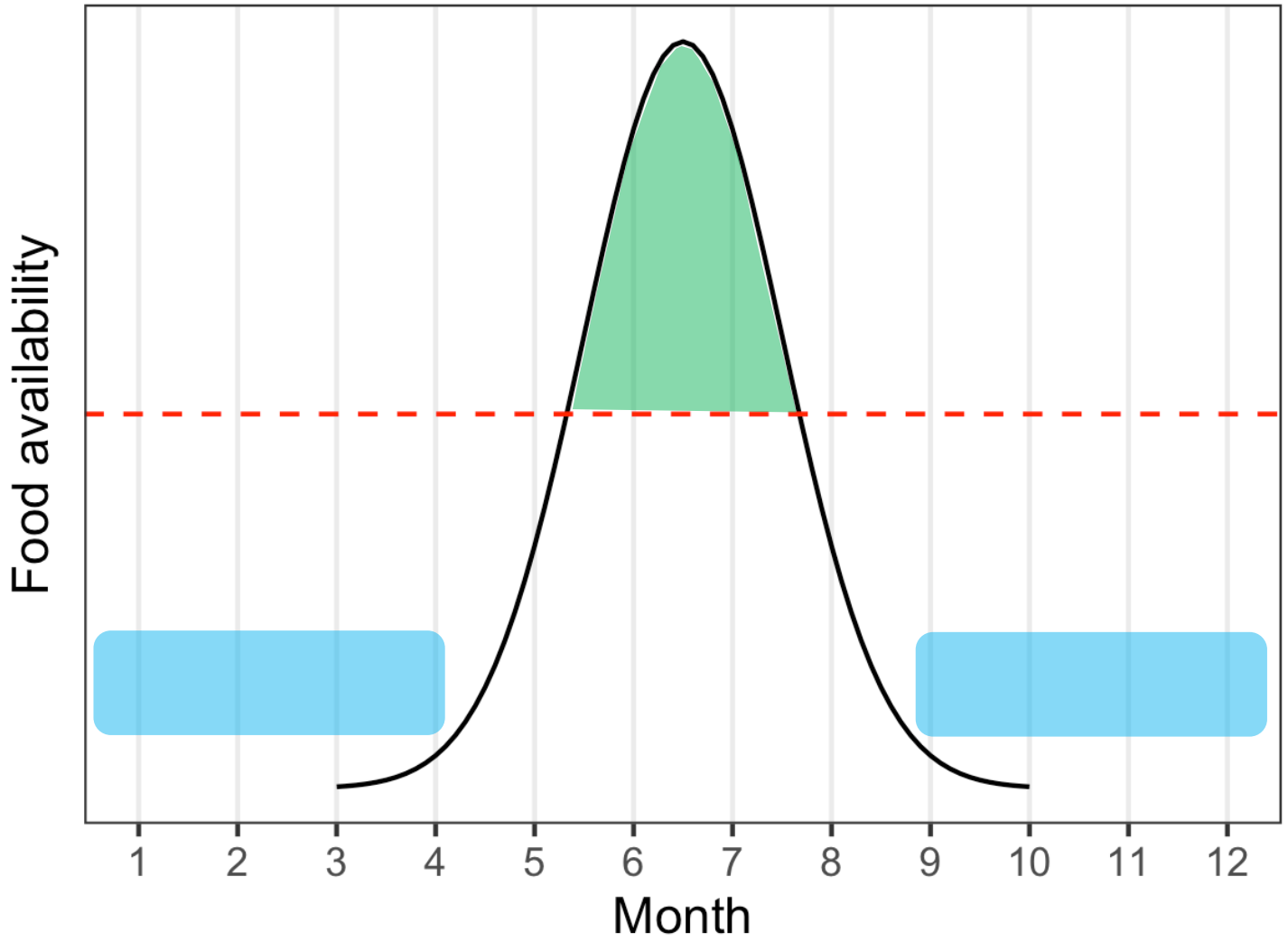

Figure 1. Food preservation and distribution across a year period.

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Food Spoilage

Microbial spoilage

Molds

Yeasts

Bacteria

Non-microbial spoilage

Enzymes

Moisture loss

Oxygen

Insect contamination

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Food Spoilage

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Clostridium botulinum

- Ubiquitous bacteria – soil and water
- Bacteria and spores alone do not cause disease
- Toxin does!

Spores germinate when:

- Absence of O_2
- Low acid (pH > 4.6)
- 40 °F to 120 °F
- Relatively high moisture

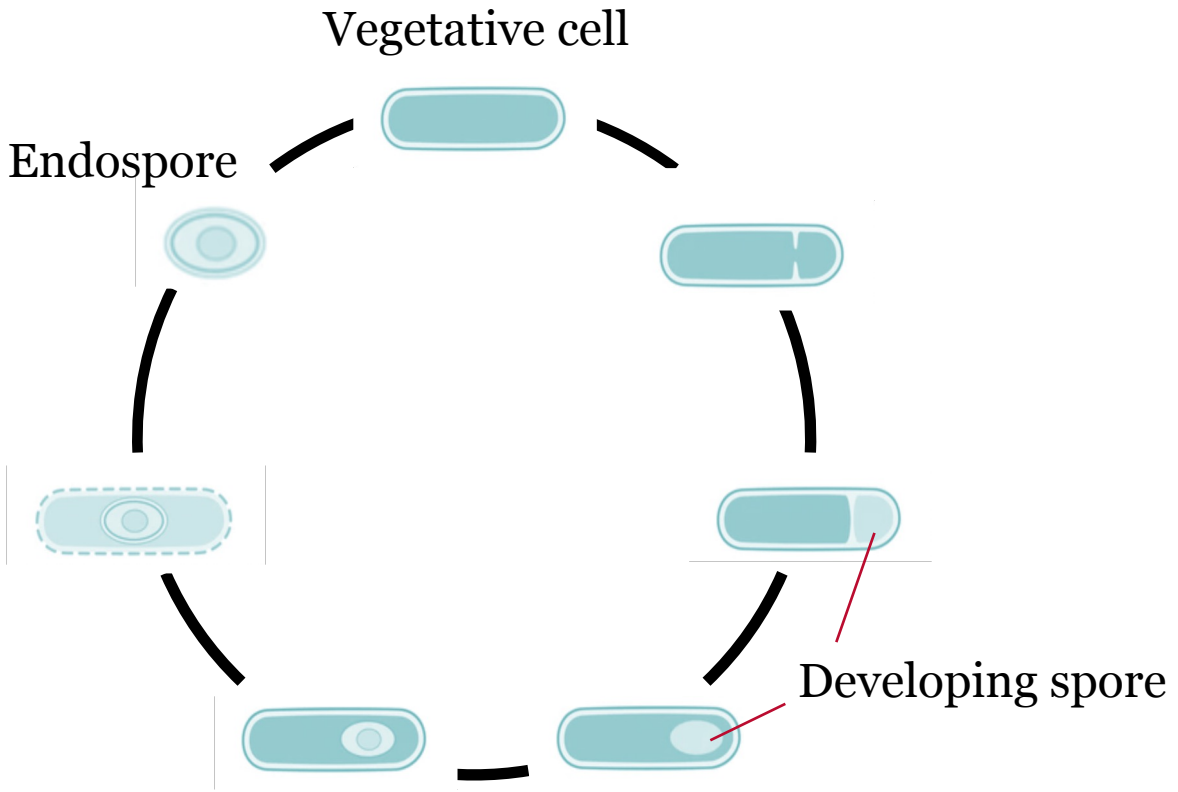

Figure 2. Endospore formation

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Botulinum toxin

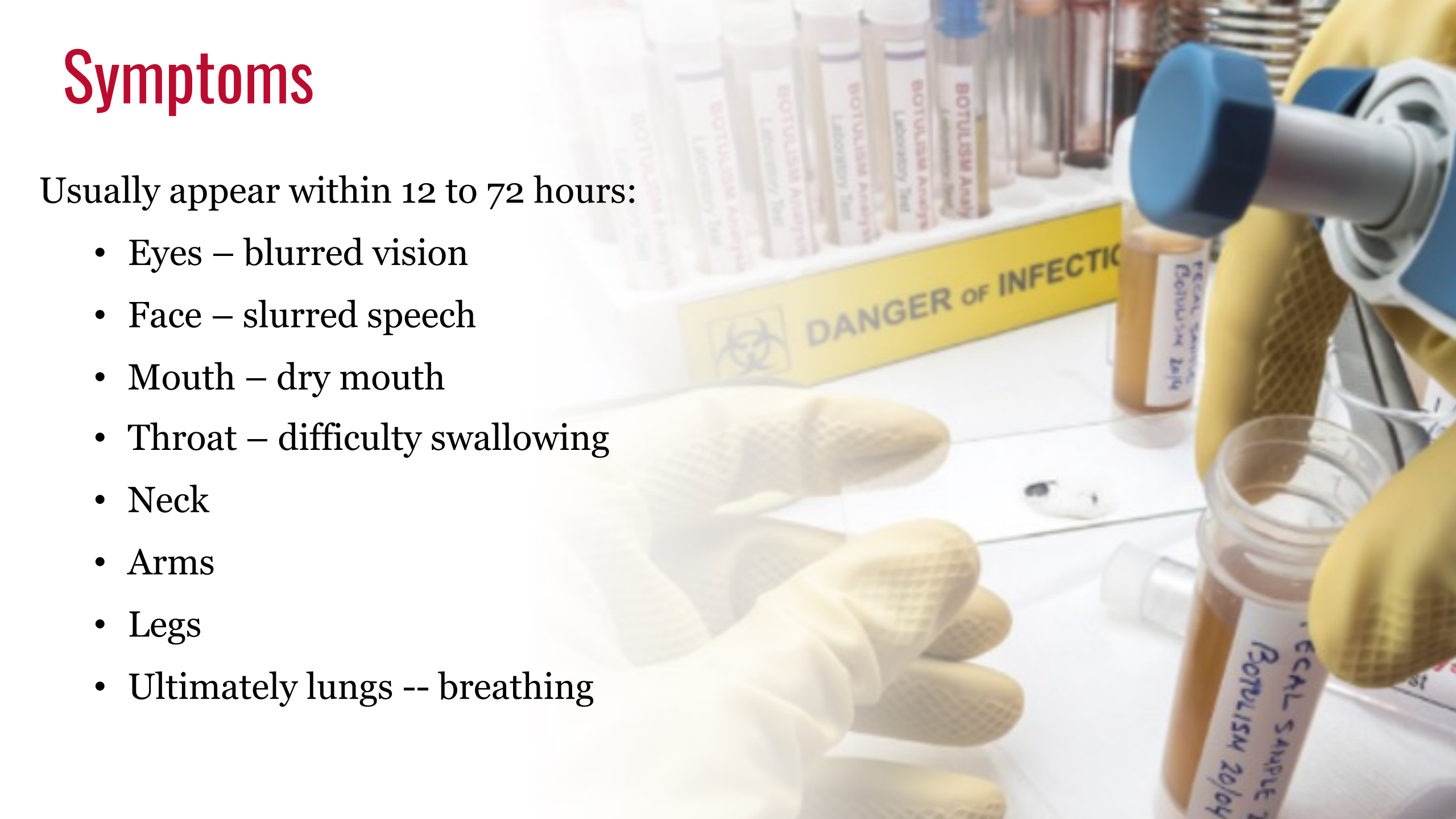
- Deadliest known
- 1 g can kill more than 1 million people
- Contaminated food doesn't smell, taste, or look differently
- Antitoxin is available – slow recovery
- Potential nerve damage

Dhhaked et al., 2010

Symptoms

Usually appear within 12 to 72 hours:

- Eyes – blurred vision
- Face – slurred speech
- Mouth – dry mouth
- Throat – difficulty swallowing
- Neck
- Arms
- Legs
- Ultimately lungs -- breathing



Botulism outbreaks

Home canned foods in Washington State (2022)

- 170 jars of contaminated food
- 1 person died
- Jars safely disposed

Washington State Public Health Service, 2022

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Spoilage prevention

Canning

1. Removal of oxygen
2. Heat
3. Other: Acids Salts Sugars

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When does it start?

Selection

1. Firm, ripe, unblemished products
2. Don’t use overripe or decaying produce
3. Process within 2 to 3 hours

Preparing/handling

1. Wash your produce
2. Rinse using running water
3. Do not soak

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Principles of Canning

- Heat + vacuum seal
- Heat destroys microorganisms and inactivates enzymes
- Air is driven from inside the jar during heating
- The vacuum seal is formed during cooling

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Canning methods

Boiling water process

Credit: Waterbury Public. Co.

Pressure process

Credit: Corrie Cook Inc.

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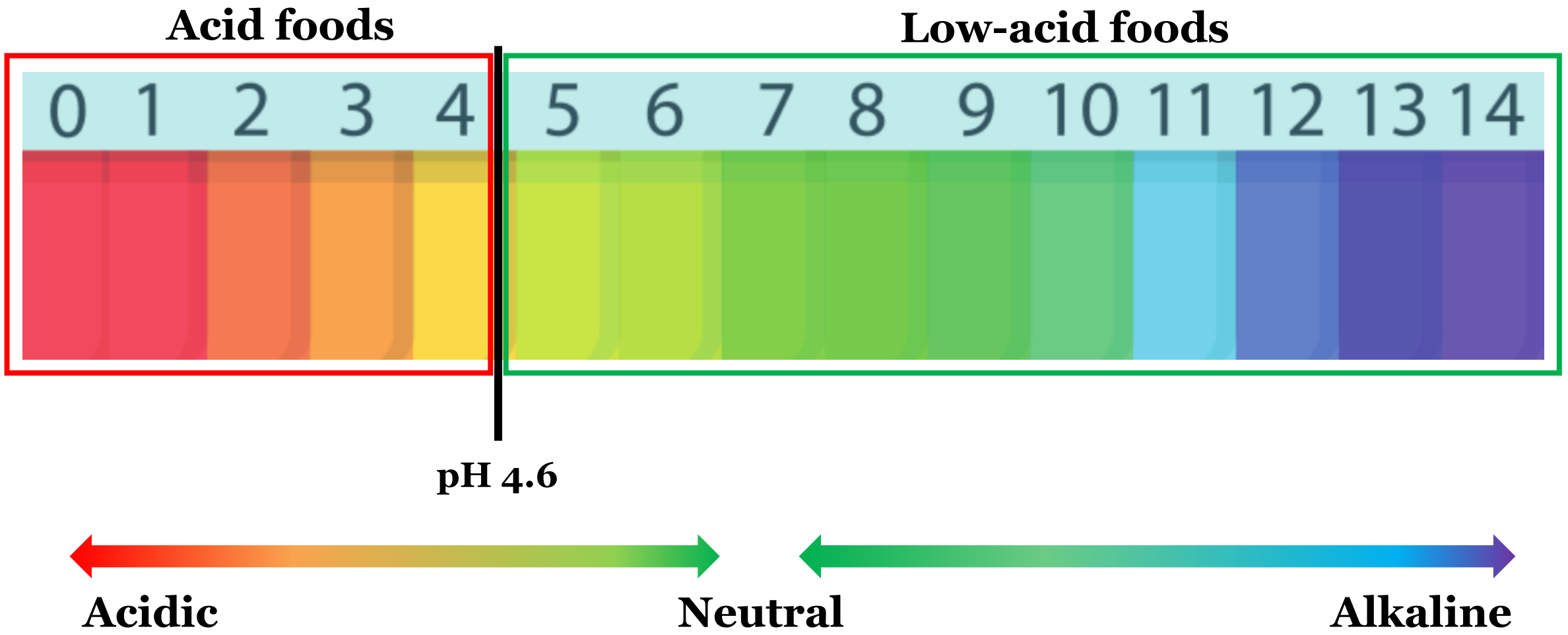
Which one should I use?



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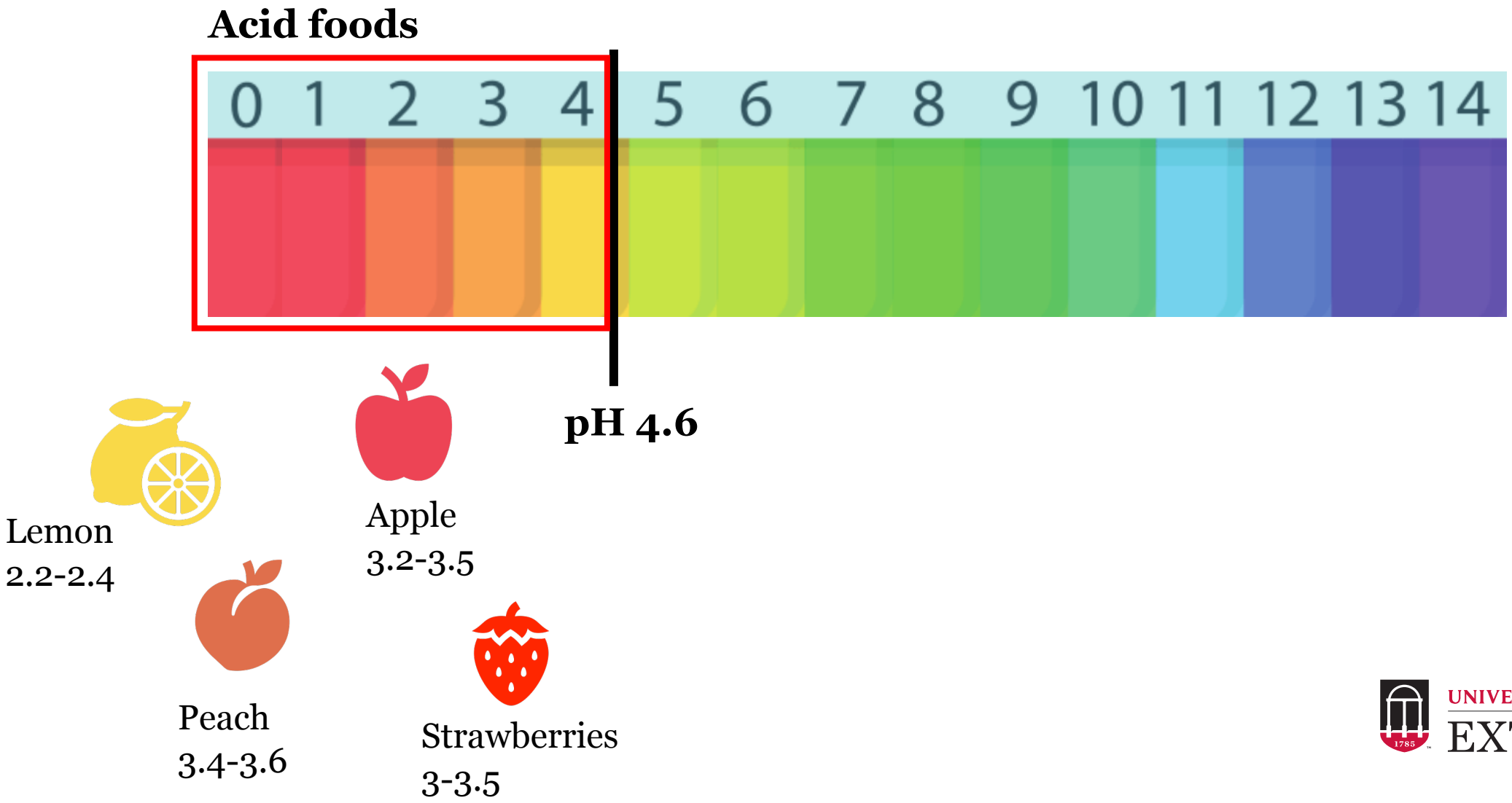
Acid foods (pH ≤ 4.6)



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Low-acid foods (pH > 4.6)

Bananas
4.7-5.2

Eggplant
5.5-6.5

Fish
6.8-7.8

Corn
5.9-7.30

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Summary

Acid foods ≤ pH 4.6 > Low-acid foods

Boiling water process

Credit: Waterbury Public. Co.

Pressure process

Credit: Corrie Cook Inc.

Factors affecting process times

1. Acidity (pH)
2. Method of pack
3. Food composition
4. Liquid to solid ratio
5. Initial temperature of food
6. Temperature of processing
7. Size and shape of jar
8. Altitude

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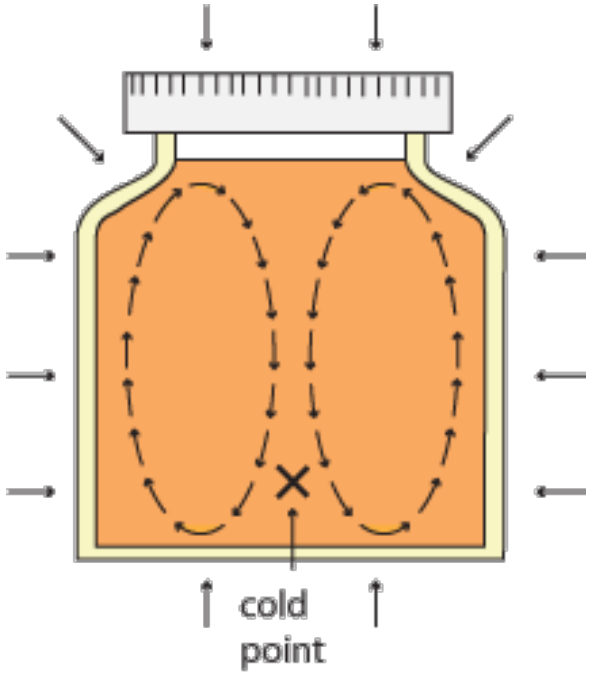
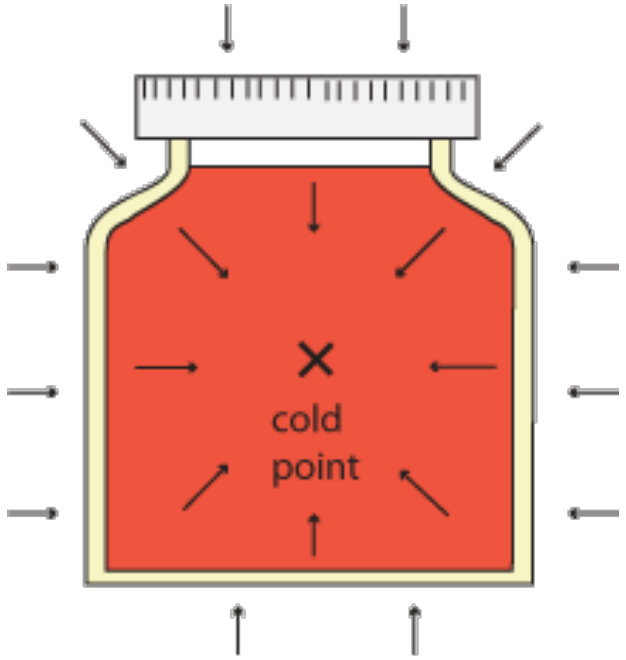
Research behind a recipe



Convection heating
(liquid in a jar)



Conduction heating
(solid food in a jar)

NCHFP

Gebarowski, 2022

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Common questions

Measuring the pH at home

- Why it is not a good idea?
- pH alone - limited information
- Specific methodologies
- Special equipment and supplies
- Paper strip (litmus paper) ≠ pH meter

Common questions

Dry Canning (e.g., Potato)

- Potato is a low-acid food
- Heat transfer
- *Clostridium botulinum* testing at laboratory – presence and absence
- One sample – what does that tell me?
- Analogy: Carla never had a car accident, therefore NOBODY in the world will have a car accident.

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Common questions

Dry Canning (e.g., Potato) cont.

- Risk of *Clostridium botulinum* (Botulism).
- **Dry canning is not recommended!**

Validated recipe

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Resources

Research-based information

1) Universities and Cooperative Extension Service

National Center for Home Food Preservation
College of Family and Consumer Sciences
UNIVERSITY OF GEORGIA

WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

Book

So Easy to Preserve

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Resources

2) Government Agencies

USDA United States Department of Agriculture

FDA U.S. FOOD & DRUG ADMINISTRATION

CDC Centers for Disease Control and Prevention

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Thank you!!

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