2018 Spring Webinar Series
2 p.m. CST

EXTENDING KNOWLEDGE → CHANGING LIVES

NDSU EXTENSION SERVICE
Upcoming Webinars

• March 28 – Weed Management and Soil Fertility for Organic Vegetable Production
  – Greta Gramig, Associate Professor, Plant Science, NDSU

• April 4 – North Dakota Cottage Food Law Update
  – Julie Wagendorf, Director, Food and Lodging Division, North Dakota Department of Health
FSMA Produce Safety Grower Training Workshop

- April 5, 8 am to 5 pm

- Held at ND Farmers Union in Jamestown, ND

- Trainers: Connie Landis-Fisk; Holly Mawby; Julie Garden-Robinson

- Register online on the NDSU “field to fork” website
  • www.ag.ndsu.edu/fieldtofork
  • $25, including meals and snacks)
Please Complete the Survey

• Please complete the short online survey that will be emailed to you after today’s webinar. It will take just a couple minutes!

• Be sure to sign up for an opportunity to win a prize in the drawing. After submitting the survey, a form to fill out with your name/address will appear.

• Acknowledgement: This project was supported by the U.S. Department of Agriculture’s (USDA) Agricultural Marketing Service through grant 14-SCBGP-ND-0038.
Developing and Selling Food Products That are Safe and Tasty

Clifford Hall
NDSU Plant Sciences
clifford.hall@ndsu.edu
Outline

- Product Development
- Sensory evaluation – Do people really like my product?
- Food Safety Refresher
- Basis for recipes
- Where do I find Information
- Your questions
Product Development

- Definition

Process where a concept becomes a food product in the marketplace
Market Assessment

- What products are people wanting?

SWOT Analysis

- Strength
- Weakness
- Opportunity
- Threats

Statistics – Failures
- New products – 72%
- Line Extensions – 55%
Questions to answer in early development phases

• Who are the primary customers for your product?
  – Age
  – Economics
  – Tradition
  – Unique Niche

• What products are you competing against in the marketplace?
  Could be direct or indirect.
  – Consumer Packaged Products
  – Food Service

  • Are products:
    – Direct: “Product” vs “Product”
    – Indirect: Product meets need to replace another
Questions to answer in early development phases

• Why should someone buy your product, e.g., what are the “selling points” for your product?
  – Nutrition
  – Convenience
  – Cost
  – Sensory
  – Unique

• How are you going to make your product, e.g., what are the major challenges for your product?
  – Equipment
  – Ingredient Availability & Cost
  – Shelf Life
  – Processing Experience
SWOT Analysis (Example)

- Strength
- Weakness
- Opportunity
- Threat

Frozen Italian Soup Bowls

https://www.allrecipes.com/recipe/25210/italian-bread-bowls/
How do I know My Product is the Best?

• Sensory Science
  – definition
  “a scientific method used to evoke, measure, analyze, and interpret those responses to products as perceived through the senses of sight, smell, tough, taste and hearing” *(Stone and Sidel, 1993)*.
How do I know My Product is the Best?

• Sensory Science
  – Objective opinions are needed on
    • Preference
    • Acceptance / liking
Example: Preference

- What approach(es) do we use?
  - Paired Comparison
  - Ranking
Example: Preference

- What this allows us to say about product?
  - Indicates is a product is preferred
  - Measures relative order of preference between several samples
  - Ad Claim development
Example: acceptance

• What approach(es) do we use?
  – Hedonic Scaling (liking)
  – Just Right (optimizing)
Example: acceptance

- What this allows us to say about product?
  - Degree of product liking
  - Measures the relative order of acceptance b/w several samples
  - A direction for formulation/recipe change (Just Right)
• According to the FDA, foods fit into three classes:

- Low Acid $\rightarrow$ pH $> 4.6$
- Acid $\rightarrow$ natural pH $\leq 4.6$
- Acidified $\rightarrow$ pH $\leq 4.6$ by addition of acid
Examples:

- **Acid:**
  - Fruits such as berries and apples
  - Fermented products such as sauerkraut & pickles

- **Low acid:**
  - All vegetables
  - Fruit such as melons
  - Meat products

- **Acidified:**
  - Any food that has sufficient acid (lemon juice, vinegar, citric acid) added to make the equilibrium pH of the food 4.6 or less
Basis for recipes

1) Boiling Water Canning (212°F at sea level)
   • Used for acid foods and acidified foods

2) Pressure Canning (at least 240°F)
   • Used for low acid foods (and mixtures of acid and low acid foods)
   • Low-acid foods cannot be sold to the public

USDA Guidelines for Canning Acidic and Acidified Foods

http://nchfp.uga.edu/how/general/ensuring_safe_canned_foods.html
Why all the concern about my recipe and how it is processed?

- The *botulinum* toxin, one of the deadliest known, causes botulism food poisoning.
- 1 mg can kill 655 tons of mice.
- Food can contain toxin without showing signs.
- Antitoxin is available, but there is slow recovery. Permanent nerve damage possible.
• *C. botulinum* to germinate and produce toxin, the spores need the following conditions:
  – Anaerobic
  – Low acid (pH > 4.6)
  – 40°F to 120°F
  – Relatively high moisture

![Diagram showing the process of spore germination and toxin production by *Clostridium botulinum*]
Where do I start?

• Identify product that you are interested in selling

• Does the product meet the FDA definition of acid or acidified food?
  – No? If hermetically sealed high water activity food, not eligible for processing at home for commercial sale.
  – Yes? Processing at home for commercial sale acceptable if conditions of the FDA definition are met.

• Find USDA approved recipes

• Identify function and pH of ingredients
### Food and Food Ingredients

- **pH of ingredients**

<table>
<thead>
<tr>
<th>Apple – Delicious</th>
<th>3.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple – Golden Delicious</td>
<td>3.6</td>
</tr>
<tr>
<td>Apple – Jonathan</td>
<td>3.33</td>
</tr>
<tr>
<td>Apple – McIntosh</td>
<td>3.34</td>
</tr>
<tr>
<td>Apple Juice</td>
<td>3.35-4.00</td>
</tr>
<tr>
<td>Apple Sauce</td>
<td>3.10-3.60</td>
</tr>
<tr>
<td>Apple – Winesap</td>
<td>3.47</td>
</tr>
</tbody>
</table>
Food and Food Ingredients

• pH of ingredients

<table>
<thead>
<tr>
<th>Common Ingredients</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>6.1-6.4</td>
</tr>
<tr>
<td>Corn starch</td>
<td>4.0-7.0</td>
</tr>
<tr>
<td>Corn syrup</td>
<td>5.0</td>
</tr>
<tr>
<td>Flour</td>
<td>6.0-6.3</td>
</tr>
<tr>
<td>Honey</td>
<td>3.9</td>
</tr>
<tr>
<td>Molasses</td>
<td>5.0-5.5</td>
</tr>
<tr>
<td>Sugar</td>
<td>5.0-6.0</td>
</tr>
<tr>
<td>Vinegar</td>
<td>2.0-3.4</td>
</tr>
</tbody>
</table>
Food and Food Ingredients

• Role of ingredients

✓ **Fruit or Vegetable** - provides the base flavor, texture and color/appearance for the product:
  
  Fruit = Acid       Vegetable = Low Acid

✓ **Sugar** – at high amounts, sugar functions as a preservative. In small amounts, flavor/sweetness is primary function. **Low Acid**

✓ **Salt** – at high amounts, salt functions as a preservative. In small amounts, flavor/saltiness is primary function. **Low Acid**
Food and Food Ingredients

- Role of ingredients
  - **Corn Starch** - provides texture and viscosity. **Low Acid**
  - **Pectin** – provides texture. **Low Acid / Acid**
  - **Calcium chloride** – enhances firmness. **Low Acid**
  - **Lemon juice / Vinegar** – provides acidity and flavor. **Acid**
  - **Citric Acid** – provides acidity and tartness. **Acid**
Food and Food Ingredients

• Role of ingredients

✓ Corn Syrup - provides sweetness. Low Acid

✓ Honey – provides sweetness. Acid

✓ Spices / Herbs – enhances flavor. Low Acid
## Role of ingredients: Apple Chutney

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Function</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 4 quarts (16 cups) pared, cored, chopped tart apples</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 1 cup chopped onions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 1 cup chopped sweet red bell peppers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 2 teaspoons seeded and finely chopped red Serrano pepper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 12 ounces seedless golden raisins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 4 cups light brown sugar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 3 tablespoons mustard seed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 2 tablespoons ground ginger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 2 tablespoons ground allspice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 2 teaspoons canning salt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 1 clove garlic, crushed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 4 cups apple cider vinegar (5%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Food and Food Ingredients

#### Role of ingredients: Apple Chutney

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Primary Function</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 quarts (16 cups) pared, cored, chopped tart apples</td>
<td>texture/flavor/acid</td>
<td>3.20-3.55</td>
</tr>
<tr>
<td>1 cup chopped onions</td>
<td>flavor</td>
<td>5.30-5.85</td>
</tr>
<tr>
<td>1 cup chopped sweet red bell peppers</td>
<td>flavor</td>
<td>5.20-5.93</td>
</tr>
<tr>
<td>2 teaspoons seeded and finely chopped red Serrano pepper</td>
<td>flavor</td>
<td>4.80-6.00</td>
</tr>
<tr>
<td>12 ounces seedless golden raisins</td>
<td>texture/flavor</td>
<td>3.80-4.10</td>
</tr>
<tr>
<td>4 cups light brown sugar</td>
<td>sweetness/flavor*</td>
<td>5.00-6.00</td>
</tr>
<tr>
<td>3 tablespoons mustard seed</td>
<td>flavor</td>
<td>6.00</td>
</tr>
<tr>
<td>2 tablespoons ground ginger</td>
<td>flavor</td>
<td>5.60-5.90</td>
</tr>
<tr>
<td>2 tablespoons ground allspice</td>
<td>flavor</td>
<td>6.00-7.00</td>
</tr>
<tr>
<td>2 teaspoons canning salt</td>
<td>saltiness/flavor*</td>
<td>7.00</td>
</tr>
<tr>
<td>1 clove garlic, crushed</td>
<td>flavor</td>
<td>5.80</td>
</tr>
<tr>
<td>4 cups apple cider vinegar (5%)</td>
<td>flavor/pH adjustment</td>
<td>2.00-3.40</td>
</tr>
</tbody>
</table>
Where do I go to get food safe recipes?

USDA Publications

USDA Complete Guide to Home Canning, 2015 revision

Adobe Reader 10 (or a higher version) is needed for proper viewing and printing of the USDA canning guide files. You can download the free Adobe Reader from http://get.adobe.com/reader/ . We still recommend selecting ‘print preview’ before printing a guide to make sure that it will print properly on your computer system. All 8 links below make up the electronic version of the USDA canning guide; the book was split into the 8 files for easier downloading.

The 2015 Complete Guide to Home Canning is also being sold in print form by Purdue Extension: The Education Store. All inquiries about purchases will be handled by them. Their information page on the print version of this guide is located at https://www.extension.purdue.edu/usdacanning/.

Introduction
Guide 01: Principles of Home Canning
Guide 02: Selecting, Preparing, and Canning Fruit and Fruit Products
Guide 03: Selecting, Preparing, and Canning Tomatoes and Tomato Products
Guide 04: Selecting, Preparing, and Canning Vegetables and Vegetable Products
Guide 05: Preparing and Canning Poultry, Red Meats, and Seafood
Guide 06: Preparing and Canning Fermented Food and Pickled Vegetables
Guide 07: Preparing and Canning Jams and Jellies
Where do I go to get food safe recipes?

- NDSU Extension

https://www.ag.ndsu.edu/food/food-preservation
Where do I go to get food safe recipes?

- Ball canning - Ball® Blue Book® Guide to Preserving (37th Edition)


Where do I go to get food safe recipes?

- Ball canning

http://www.freshpreserving.com/recipes-all/
Examples other than canned products

- Deli Salad*

**Mexican Beans and Corn Salad**

This healthy recipe comes from NDSU Extension Service.

**Ingredients**

- 1 (15-ounce) can black beans, rinsed and drained
- 1 (15-ounce) can kidney beans, drained
- 1 (15-ounce) can white kidney beans, drained and rinsed
- 2 red bell peppers, diced
- 2 c. frozen corn kernels
- 1 medium red onion, chopped

**Dressing:**

- 1/2 cup olive oil
- 1/2 cup red wine vinegar
- 3 Tbsp. fresh lime juice
- 2 tablespoons white sugar
- 1 tsp. salt
- 1 tsp. crushed garlic
- 1/4 c. chopped fresh cilantro
- 2 tsp. ground cumin
- 1 tsp. ground black pepper
- 1 dash hot pepper sauce (optional)
- 1/2 teaspoon chili powder (optional)

*Check ND Dept. of Health – Food and Lodging for guidance; Retail outlet may have additional rules.*
Examples other than canned products

Old-fashioned Potato Salad

Ingredients:
- 3 medium potatoes, chopped
- 1 egg, hard-cooked and chopped
- 2 Tbsp. low-fat mayonnaise
- 1/8 tsp. pepper
- 1/2 Tbsp. onion, chopped
- 1/4 cup celery, chopped

Directions:
- Wash, peel and cube potatoes. Place potatoes in sauce pan; add just enough water to cover. Cover and boil for about 10 minutes or until potatoes are tender but not mushy. Put egg in a pan with water to just cover. Bring to a boil, cover and turn off the heat. Let sit on the burner for 15 to 17 minutes. Remove water and let cool. Peel and chop. While potatoes and egg are cooking, combine mayonnaise, pepper, onion and celery in a 3-quart salad bowl. Add cooled potatoes and egg. Stir just to blend. Serve. Refrigerate leftovers.

*Check ND Dept. of Health – Food and Lodging for guidance; Retail outlet may have additional rules.
Where do I Find Information Beyond Recipes?

- **Government Websites**
  - **State:**
    - health department (https://www.ndhealth.gov/FoodLodging/)
    - extension services (http://ucfoodsafety.ucdavis.edu/files/266402.pdf)
  - **Federal:**
    - FDA (https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ AcidifiedLACF/default.htm)

- **Commercial Website**
  - Ball Corporation (https://www.freshpreserving.com/)
Where do I Find Information Beyond Recipes?

https://www.ag.ndsu.edu/food/food-entrepreneurship/learning-modules/learning-modules-1
Questions?
www.ag.ndsu.edu/fieldtofork