Brining Techniques

Unit: Culinary Science

Problem Area: Food Science

Lesson: Brining Techniques

Student Learning Objectives.

Instruction in this lesson should result in students achieving the following objectives:

1. **Explain the benefit of brining food.**
2. **Analyze the chemical process of brining meats.**

Resources.

The following resources may be useful in teaching this lesson:

E-unit(s) corresponding to this lesson plan. CAERT, Inc. http://www.mycaert.com.

Chu, Michael. "Brining," *Cooking for Engineers*®. Accessed Jan. 8, 2014. http://www.cookingforengineers.com/article/70/Brining.

Coucquyt, Peter. "Brining or Pickling," *Sense for Taste*. Accessed Jan. 8, 2014. http://cookingsciencetradition.blogspot.com/2011/02/brining-or-pickling.html.

Culinary Institute of America. *Preserving: Putting Up the Season's Bounty*. Houghton Mifflin Harcourt, 2013.

"How to Brine a Turkey," *Culinary Institute of America: Kitchen Daily*. Accessed Jan. 8, 2014. http://www.youtube.com/watch?v=moDuqN2lNtc.

Labensky, Sarah R., Priscilla A. Martel, and Alan M. Hause. *On Cooking: A Textbook of Culinary Fundamentals*, 5th ed. Prentice Hall, 2012.

Ruhlman, Michael, Brian Polcyn, and Thomas Keller. *Charcuterie: The Craft of Salting, Smoking, and Curing.* Norton, 2005.

"What Are Brine Pickles?" *Perfect Pickler*. Accessed Jan. 8, 2014. http://www.perfectpickler.com/what-are-brine-pickles/.

Equipment, Tools, Supplies, and Facilities

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials

Key Terms.

The following terms are presented in this lesson (shown in bold italics):

- brine
- brining
- curing
- denatures
- diffusion
- Kosher salt
- membranes
- nitrates
- osmosis
- pH scale
- pickling
- protein modification
- smoked
- solutes

Interest Approach.

Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

> *Ask students what they know about brines and to explain (on paper) how brines are used in cooking. Responses will likely be related to pickling but few responses generally will relate to brines for meats.*

> *Use vegetables—fresh cucumbers and dill pickles—to introduce brining. First, ask students to identify the visual differences between the cucumbers and the pickles. Ask how they would define the difference. Then cut the cucumbers and pickles, reminding students that they are really the same vegetable. Distribute pieces of cucumbers and pickles to students. Ask how they differ in touch. How do the vegetables differ in taste and texture? How are they similar? Hold up the pickle brine (juice). Let students see it, smell it, and taste it (if they want to). Ask students to brainstorm the ingredients in the brine solution.*

Finally, ask which meats might taste good pickled. What if the brine flavor was different than that for the dill pickles? What benefit, other than flavor, would brining meat offer?

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Explain the benefit of brining food.

Anticipated Problem: What is the process of brining? What are its benefits to cooking? Which foods are best suited for brining?

I. Brines and brining

A. ***Brine*** is a simple and strong salt-water solution used to treat or steep food to preserve its color and to prepare foods for preservation: pickling, keeping, or bottling. Brine for meats is an aromatic (onion, carrot, and celery) liquid into which herbs and salt are added. Brine solutions can be a mixture of salt, saltpeter, sugars (e.g., granulated, brown, molasses, and honey to improve browning), spices, herbs, and water for salting meat to keep and preserve it. Most brined meat is later cooked (e.g., grilled, smoked, baked, or deep-fried). Brining adds flavor and tenderness. In addition, it reduces cooking time.

1. Brines for pickling vegetables extract natural sugars and moisture to guard against bacterial spoilage.
2. A 10 percent brine solution is the strongest used for food processing. The 10 percent brine solution is made from 1½ cup pickling salt dissolved in 1 gallon of liquid (or 6 tablespoons of salt per quart of liquid).
3. Brines improve the juiciness and moisture content of pork, poultry, and shellfish.

B. ***Brining*** is the process of immersing foods, usually meats, in a solution of liquid, salt, sugar (not always), and desired spices and herbs. Brining liquid that soaks fruits or vegetables is typically called ***pickling***. Because cucumbers are so frequently brined, they are known as "pickles," although the pickling process is the same regardless of the type of produce. The brining process is generally used with two food groups:

1. Meats—Brining adds flavor and moisture to meat. Brined meat (e.g., corned beef and turkey) must be kept at temperatures of 36° to 38°F to prevent foodborne disease. The term "corn" (in corned beef) is from the Anglo-Saxon word for granule or pellet that refers to the salt grains used to make brine.
2. Produce—Brining or pickling produce adds flavor and preserves the food for an extended shelf life. Typically, produce that has been pickled is kept in sealed

jars that have been processed to prevent bacterial growth. As a result, they are stable in long, unrefrigerated storage until opened. Examples are olives, sauerkraut, fruits, cherries, and cucumbers.

C. Foods for brining

1. Meats
   a. The brining liquid for meats is heated to dissolve the sugar and salt. The liquid is cooled before adding the meat to prevent excessive bacterial growth. Meat brining is always conducted under refrigeration to prevent bacterial growth by keeping raw meats out of the temperature danger zone. Brine for meats should never be reused due to the level of bacterial contamination from raw meats.
   b. Lean and mild flavor meats, typically those that need to be fully cooked (e.g., not served rare or medium) and can become overcooked and dry, are good choices for brining. Also, some poultry and some seafood are excellent choices for brining. Further, the planned cooking method can make brining less or more attractive as a pre-cooking technique. Cooking methods in which high or prolonged dry heat is used quickly remove moisture from the food. Brining is an exceptionally good choice when it is desirable to add moisture and flavor to the meat prior to cooking, resulting in a moister finished product.
      (1) Pork loin, ham, beef brisket, chicken, and turkey are examples of lean, mild-flavored meats that have great results from brining.
      (2) Meats to be ***smoked*** (a long, slow, drying processes in which meats are exposed to vapor and gases at low temperatures) greatly benefit from brining before the smoking process begins. Smoking adds flavor to meats and has some preservative qualities. Brined meats stay moister and have increased flavors when smoked.
      (3) Conversely, game birds (e.g., duck and geese), lamb, and prime rib all have high fat content and tend to retain their juices and flavors better during cooking, making them poor choices for brining. No remarkable benefit results from brining these foods.
2. Most vegetables and some fruits are pickled, though it is a far more common choice for vegetables because salt is the predominant flavoring ingredient in the brining solution. The salty flavor is better suited to vegetable flesh than to fruit flesh.
   a. Firm and crunchy vegetables (e.g., cucumbers, peppers, olives, cabbage, green tomatoes, onions, beets, carrots, broccoli, and cauliflower) are perfectly suited for brining (or pickling).
   b. Green leafy vegetables are not suitable for brining because of their delicate nature.
   c. Delicate fruits with high water content (e.g., berries and oranges) are not suited for brining; they fall apart.
   d. Firm fruits and even fruit rinds produce excellent results when pickled (e.g., apples, pears, and cherries).

e. Pickling is a preservation method. Pickled fruits and vegetables last for months in sealed jars. Pickling has no real time limit because at a certain point the vegetable stops absorbing the brine, but pickling does require a minimum of several days. Vegetables cooked in brine may be poured—with the brine—into a bowl and kept covered in the refrigerator. For extended non-refrigerated shelf life, a rather detailed and specific canning or jarring procedure must be followed.

3. Fish and seafood
   a. Fish with high fat content (e.g., whole salmon rather than steaks or filets) have little need for brining. However, if the whole fish is to be grilled or smoked (taking more cooking time), brining provides excellent results. All lean fish that will be cooked with long or high heat will benefit from brining and its flavoring and moisture retention.
   b. Seafood that tends to be mushy in texture (shrimp) or large cuts of fish that will be cooked for long periods or cooked under high heat (e.g., grilling or broiling) benefit from brining. Aside from adding moisture and flavor, the brine actually firms softer seafood.

D. Curing

1. ***Curing*** is a preservation process accomplished by drying, salting, or smoking to draw out water (diffusion) from meat, leaving it less susceptible to bacterial growth. Curing temperatures are 36° to 40°F. Curing may introduce nitrates into food. High-fat foods are cured (e.g., bacon, ham, sausage, and whole salmon). In its truest form, curing literally means to "save" or "preserve." Brining, in its truest form, does not preserve; its goal is to tenderize and keep meats moist during cooking. Factors that influence curing include:
   a. Temperature—A higher temperature results in a faster curing process.
   b. Size—A larger piece of meat takes longer to cure.
   c. Moisture—More moisture results in a longer curing time.
   d. Salt concentration—Higher salt concentration results in a shorter curing time. Meat cured only with salt has a better flavor but does develop a dark color that may be objectionable to some consumers.
   e. Fat—A higher fat content results in a slower curing time.
   f. pH level—A lower pH results in a faster curing time.
2. ***Nitrates*** are a naturally occurring mineral rich in sodium and nitrogen that inhibit bacterial growth and are particularly useful in preserving meats. Nitrates in meats provide a distinctive flavor (a flavor often tempered by subsequent smoking) and tend to alter the color of meat to pinkish or brownish. A common nitrate used to cure meats is sodium nitrate ($NaNO_3$). It does not cure meat directly; at its introduction to meat, not much happens. Eventually, micrococci bacteria in the meat start to react with nitrate and create sodium nitrite ($NaNO_2$) to start the curing process. If too few micrococci bacteria are present, the curing process may be inhibited.

a. Putting nitrate into a refrigerator kept solution (below 40°F) inhibits the development of bacteria that may make the meat unable to react with the nitrate. However, sodium nitrite works well at refrigerator temperatures.
b. When salt is used with nitrates/nitrites, it is a very effective preserving combination.
c. Adding nitrites to meat improves the flavor, prevents food poisoning, tenderizes the meat, and develops the pink color widely known and associated with smoked meats. Yet some cancer-related concerns exist to using nitrates.

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–A through VM–D to review the benefits of brining, curing, and smoking food.*

Objective 2: Analyze the chemical process of brining meats.

Anticipated Problem: What is the process to brine foods? What are the chemical processes involved in brining?

II. The chemical process of brining

A. Brining is a simple and fairly quick process, regardless of the meat being used. Though formulas for the solution vary from source to source, the differences are minor. A basic brining solution for meats, poultry, and seafood requires ¾ cup of salt and ⅓ cup of sugar per quart of liquid. These measurements are volume, not weight. This is important because not all salt products are of the same consistency, size, or texture. Brining and pickling alter the following properties of food:
   1. Water balance
   2. Taste and flavor
   3. Texture and color
   4. Shelf life

B. Brining is chemistry in action—specifically the actions of osmosis, diffusion, protein modification, and salt.
   1. ***Osmosis*** is the movement of a fluid (water) through a semipermeable membrane into a solution of higher solute concentration or a process of absorption. Brining involves salt and osmosis to exchange the fluid in the brine with the water inside the meat. By immersing meats in a liquid with a higher concentration of salt, the liquid is absorbed into the meat. Any flavoring added to the brine is carried into the meat by osmosis with the saltwater mixture. Loading the meat with extra moisture means the brined meat will stay moist longer while it cooks.
      a. Food cells are surrounded and sealed with thin ***membranes*** (walls). While the membranes hold the cells intact and keep cells separate, liquids can

move in and out of membranes. The movement of liquid in and out of cells through membrane walls is the process of osmosis. Typically, differing solute levels between the food and the liquid encourage this water movement through cells.

   b. ***Solutes*** are dissolved salt and/or sugar levels in liquids or moist foods. The liquid tends to move toward solutes until the solute level in the food and liquid reach the same level.

2. ***Diffusion*** is the movement of solutes in and out of cells, while osmosis is the movement of liquid in and out of cells. When salt and sugar are dissolved in liquid and food is placed into that liquid, the solutes are able to pass through the membrane of the food, making it saltier or sweeter. This chemical reaction continues until the food is removed from the brine or the brine solute level is the same as the food. Because salt and sugar attract moisture, their presence in foods tends to increase the food weight because of moisture absorption.
3. ***Protein modification*** is a process that changes the chemical structure of meat proteins. Brining modifies the chemical arrangement of proteins by fracturing some of the bonds that give protein its shape. The salt ***denatures*** (disrupts the normal alpha-helix and beta sheets in a protein and uncoils it into a random shape) the meat proteins, which causes them to uncoil and form a shape that traps water. Protein bonds are very responsive to changes in temperature, acidity, and salinity, causing the proteins to decompose slightly in brines. As a result, the salt, sugar, and other flavoring agents infuse the flesh of the foods.
   a. As proteins cook, they coagulate or solidify. The more they "tighten," the more moisture is lost, leaving the meat dry and tough. Typically, protein in meat coagulates tightly at about 160°F. Brined meat's "tight" coagulation occurs at about 180°F. (This is best exemplified in the way salt melts ice by raising the freezing temperature of water by 20 degrees.)
   b. Brined meats are more tender and are moister than meats cooked by dry heat methods because more liquid is absorbed during brining, so the constriction of meat proteins is delayed by about 20 degrees.
4. Salt dissolves protein in muscle, which causes the protein to change and trap more moisture. A combination of protein modification and salt results in reduced moisture loss during smoking.
   a. ***Kosher salt*** is a large-grained, flakey salt made without the iodine and anti-caking additives in table salt. While table salt dissolves easily and runs off meat, the larger Kosher salt crystals disperse more evenly and cling to meat. The weight of one cup of Kosher salt is less than the weight of one cup of table salt. Chemically, Kosher salt works like any other salt. However, the lack of iodine and anti-caking chemicals in Kosher salt make it the preferred salt choice for brine preparation.
   b. The ratio of brine to meat is generally one quart of brine per pound of meat. The salt-to-sugar ratio to liquid is variable for brines. However, one way to test that the brine contains a minimum salt to sugar ratio solution is that a raw shell egg floats in the brine. If the egg does not float, the ratio is

insufficient. Heavily salted water is denser than unsalted water. Therefore, solid foods will float in heavily salted water.

C. Four variables in brine composition

1. Liquid—The brine liquid is typically water, or at least part water, and may include flavorful aromatic vegetables and liquids (e.g., juices, beers, or vinegars). Naturally, flavorful liquids impart their own flavor to the brine. Care is taken not to over-flavor meats. Acidic liquids also affect the proteins in meat by making the meat more tender.
2. pH levels—All liquids fall on the pH scale. The ***pH*** (potential of Hydrogen) ***scale*** is a figure representing the acidity or alkalinity of a solution ranging from 0 to 14 on a logarithmic scale. It is important to remember that 7 is neutral (pure water is 7 on the pH scale), less than 7 is more acidic, and more than 7 is more basic.
   a. In brining, acids break down muscle tissue (meat) and tenderize it. They may add a tangy flavor. Only mildly acidic liquids (4.5 to 6 on the pH scale), such as juices and vinegars, are used in brining (if used at all).
   b. Acid in brines causes tissue (meat) to break down, resulting in the ability of meat to hold more liquid, even though diffusion tends to draw liquid out of the cells.
   c. Meat brined in acid solutions tends to weigh a bit more due to absorption of liquid.
3. Time—The length of time meat is left in brine varies based on size and how much added flavor is desired. Brining is conducted for a minimum of 30 minutes and up to 30 hours. A basic rule is one hour per pound in the solution. However, this could be higher for large turkeys or other large cuts of meat. If the meat is to be grilled for long periods of time, the sugar level in the brine should be reduced to prevent burning or excessive browning. Over-brining will result in excessively salty food. Herbs and spices (e.g., dill, bay leaf, pepper, chili peppers, and basil) may or may not be included in the brine. It is a matter of taste.
4. Immersion—Meat must stay fully immersed in the brine (no part above the liquid line). Often the meat is weighted to keep it from floating in the brine mixture.

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–E through VM–I to facilitate a discussion. Assign LS–A and LS–B.*

Review/Summary. Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Scenarios and role-playing can be extremely useful in this unit. If a textbook is being used, questions at the ends of chapters may be included in the Review/Summary.

Application.

Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.

Evaluation.

Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

Answers to Sample Test:

Part One: Completion

1. membranes
2. Kosher
3. moisture
4. pH
5. curing
6. protein modification

Part Two: Multiple Choice

1. c
2. b
3. d
4. d
5. c
6. a

Part Three: True/False

1. T
2. F
3. F
4. T
5. T
6. F

Sample Test

Name _____

Brining Techniques

Part One: Completion

Instructions: **Provide the word or words to complete the following statements.**

1. The outer walls of cells are _____.
2. Brines always include salt, and the preferred choice is _____ salt.
3. The purposes of brining meat are to tenderize, add flavor, and add _____.
4. The acid level in a food is expressed by the use of a/an _____ scale.
5. The primary purpose of _____ is to preserve meat.
6. The process that changes the chemical structure of meat proteins is _____.

Part Two: Multiple Choice

Instructions: **Circle the letter of the correct answer.**

1. Vegetables best suited for brining include all of the following except _____.
   a. cabbage
   b. beets
   c. spinach
   d. carrots
2. Aside from salt, the most common dry ingredient in brine is _____.
   a. water
   b. sugar
   c. pepper
   d. dill

3. The movement of liquid in and out of cells is called _____.

   a. brining
   b. curing
   c. solutes
   d. osmosis

4. Brining fruits or vegetables is also known as _____.

   a. osmosis
   b. curing
   c. souring
   d. pickling

5. Brining meat is particularly useful when the meat will be _____.

   a. baked
   b. sautéed
   c. grilled
   d. steamed

6. Brining meat raises the temperature that meat protein coagulates by about _____°F.

   a. 20
   b. 30
   c. 10
   d. 40

Part Three: True/False

Instructions: **Write *T* for true or *F* for false.**

_____1. Osmosis is the movement of a fluid through a semipermeable membrane into a solution of higher solute concentration; diffusion is the movement of solutes in and out of cells.

_____2. Nitrates are commonly used in brining.

_____3. Meats high in fat, such as duck, are well suited for brining.

_____4. One cup of Kosher salt weighs less than a cup of regular table salt.

_____5. Meats typically weigh more after brining than before brining.

_____6. A good brining technique is to have the liquid at least halfway up the food and then to turn the food daily.

BRINING OR PICKLING

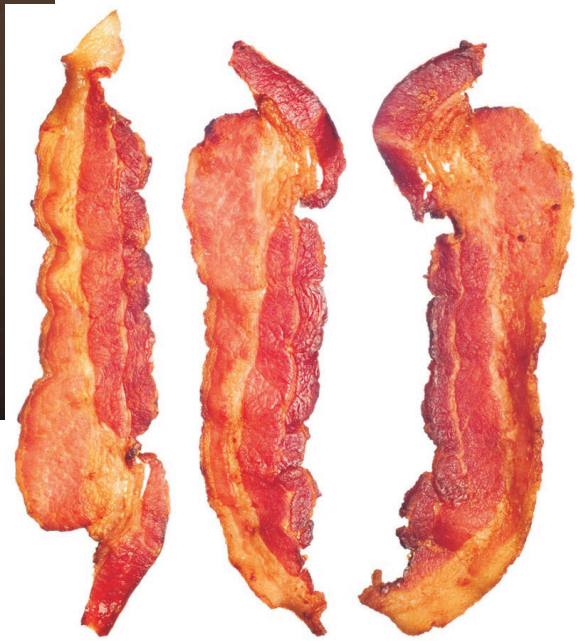
Brining is commonly called pickling when used with vegetables—even if cucumbers are not being used. Note the liquid comes to the top and that the brine may include various herbs and spices.

LIQUID BRINING

Chicken is a good meat choice for liquid brining. Most meat and poultry brines add aromatics (carrots, onions, and celery) and other spices, herbs, and vegetables for flavor.

CURING

Cured meats are often treated with a dry salt mixture rather than liquid brine. Ham, sausage, and bacon are typically cured. Notice how dry each of these meats appears.



SMOKING

Smoking meat is a typical process conducted after curing, even for fish.

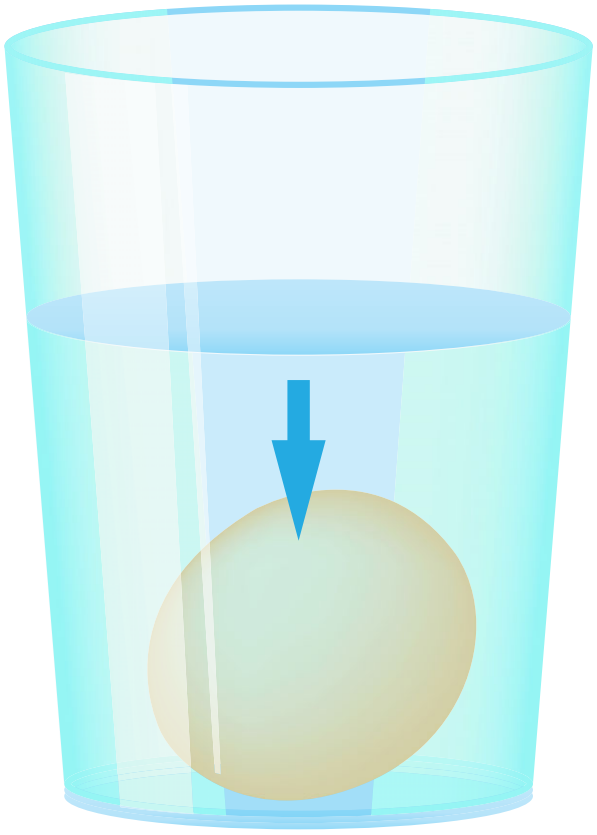
SALTS

Compare the size of Kosher salt crystals to those of table salt. By weight, the flakey Kosher salt crystals weigh less than table salt crystals.

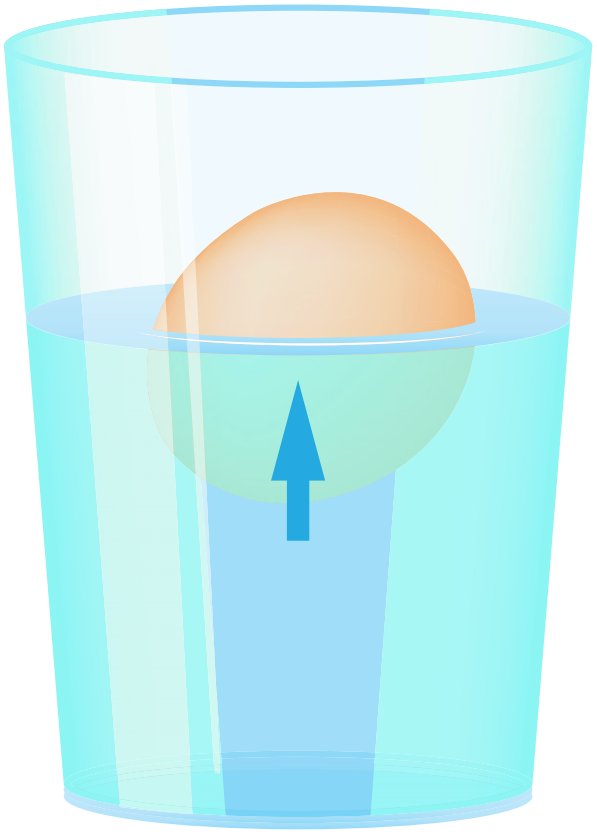
VM–F

BRINE VS. WATER

Try this simple physics experiment: Place one fresh shell egg in a glass of fresh water and a second egg in a glass of brine. The egg in brine floats. Why? In brine, the density of the water is higher due to salt. As a result, the egg floats. In fresh water, the density of the water is less, so the egg sinks.

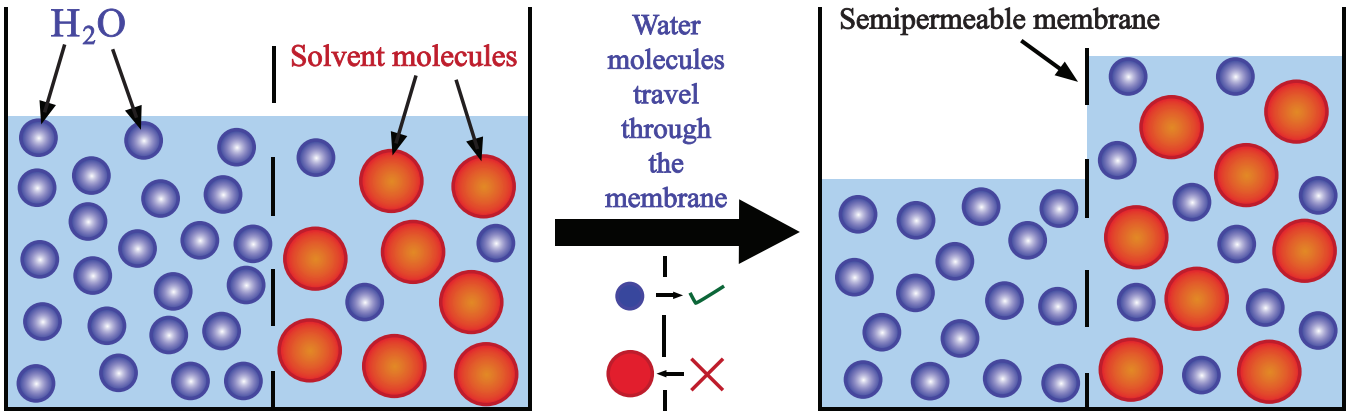


fresh water



brine

OSMOSIS



BRINING VIA OSMOSIS

Brining adds moisture to meat through osmosis. Look at the full, moist, and pinkish appearance of this corned beef brisket after brining.

DIFFUSION VIA CURING

Diffusion removes moisture and increases salt content. Consider the taste and texture of this hard salami. Its taste and texture are a result of curing rather than brining.

Name _____

Brining Review

Purpose

The purpose of this activity is to review terminology and theory related to brining.

Objectives

1. Explain brining terminology.
2. Explain brining techniques.
3. Explain the chemistry of brining.

Materials

- writing utensil
- paper
- textbook or related reference materials

Procedure

1. Work independently.
2. On your own paper, answer the following questions in a sentence or two.
   a. What is the difference between brining and pickling?
   b. What liquids are typical for making brine? Which is most common?
   c. Brining can add weight to meats. Through what method does this occur? What is the chemistry that makes it work?
   d. Why is Kosher salt preferable to table salt to make brine?
   e. What is diffusion? Be specific.
   f. What affect does the acid in brine have on meat?
   g. What are nitrates? When are they used? What affect do they have on food?

h. How is curing different from brining?
i. List three food examples well suited for:
   (1) Pickling
   (2) Curing
   (3) Brining
j. How does brining affect the proteins in meat?
k. What is a solute?
l. What is the benefit of brining food before smoking it?
m. On average, how long is meat brined before cooking (or at least before removal from the brine)?
n. What types of fish and seafood are not well suited for brining?

Brining Review

1. Student responses may vary. Please consider these responses as a guideline.

2. a. The major difference between brining and pickling is that pickling is typically done with produce. Brining is typically done with meat, poultry, and seafood. Pickling is also designed to preserve food at room temperature, and the pickled food can stay in the brine for long periods of time as compared to protein items.

   b. Water, vinegar, juices, beers, and wines are commonly used for brining. Yet water is the most common liquid used in brining solutions.

   c. Osmosis allows liquid in and out of cell membranes. In meat products, diffusion also occurs—a process where the salt and sugar mixture also enters the cells. Because salt and sugar attract moisture and some salt and sugar actually enter the meat cells, brining can actually cause meats to retain more liquid—thus weight—and be heavier than before being brined.

   d. Kosher salt is preferable to table salt for brining because it has none of the iodine or anti-caking agents found in table salt; both can affect flavor. In addition, Kosher salt weighs less cup per cup than table salt, so the food can be properly brined without making the food overly salty.

   e. Diffusion is the movement of solutes in and out of cells, while osmosis is the movement of liquid in and out of cells. When salt and sugar are dissolved in liquid and food is placed into that liquid, the solutes are able to pass through the membrane of the food, making it saltier or sweeter.

   f. Acids in a brine solution break down cells, allowing more diffusion and quicker osmosis to occur, resulting in more tender and juicier meats. They also provide a tangy flavor.

   g. Nitrates are a combination of nitrogen and salts. They are used as preservatives in meats, particularly in meats that will be smoked. Nitrates inhibit bacterial growth and impart a noticeable flavor.

   h. Curing is a dry form of brining used with meats, typically those with a high fat content. Diffusion occurs but at a slower rate because liquid is unavailable for osmosis. As salt enters the cells and weakens them, and with no other liquid available to absorb, liquid actually drains from the meat, leaving it firmer and drier (e.g., hard salami and pepperoni). Brining always uses liquid to affect the taste and texture of meat. Brining is faster, the meat is juicier and tender. In addition, it is often less salty tasting than items that are cured.

   i. Examples of foods well suited to the following preservation methods:
      (1) Pickling—cucumbers, peppers, and cauliflower
      (2) Curing—ham, bacon, sausage, and salmon
      (3) Brining—turkey, chicken, pork, and shrimp

j. Brining affects proteins in meat in the following ways: Proteins relax and absorb brine; brine changes the temperature at which the proteins coagulate; and brine keeps the protein tender after cooking.

k. Solutes are solids (e.g., salt and sugar) that have been dissolved in a liquid solution.

l. Brining before smoking food has benefits. Smoking food takes hours under low heat, drying and making the meat more susceptible to bacterial growth. Further, many smoked foods are often cooked again, commonly under high heat (grill, oven) drying the food more. Brining adds flavor and moisture to keep the meat tender and juicy.

m. Meat is brined for a minimum of 30 minutes and no more than 30 hours, depending on the size of the meat. A rule of thumb is one hour per pound.

n. Most fish and seafood can be brined, though there is no need to brine thin fillets or smaller pieces of fish with a high fat content. Thin fillets cook quickly, and fatty fish have enough fat to remain moist during cooking.

LS–B

Name _____

Brining Lab Experiment

Purpose

The purpose of this activity is to conduct a brining experiment. Brined and non-brined chicken will be cooked the same way and compared for differences according to brining theory.

Objectives

1. Test the theory versus the reality of brining.
2. Brine chicken prior to cooking.
3. Prepare a brined and a non-brined chicken using the same cooking method.
4. Compare and contrast brined chicken and non-brined chicken results.

Materials

- paper
- writing utensil
- two entire (not split) chicken breasts, raw, skin-on, and bone-in
- 1 quart of water
- ½ cup Kosher salt
- 1 tablespoon table salt
- 3 tablespoons granulated sugar
- other spices and herbs of your choice
- container for brining
- grill, fryer, fry pan and oil, sheet pan and oven, or cooking equipment of choice
- tongs
- cutting board
- knife and fork
- thermometer

Procedure

1. Work with one to three classmates.
2. Brining small pieces of meat is rather quick. This experiment will provide evidence of two primary outcomes—added weight and moister cooked meat—as a result of brining.
3. Wash and dry two full (not split), raw, chicken breasts with skin on and the bone in. It should be store wrapped under refrigeration until needed.
4. Prepare brine.
    a. To 1 quart of boiling water, add ½ cup Kosher salt, 1 tablespoon table salt, and 3 tablespoons granulated sugar. Add a bit of pepper or any seasonings (e.g., parsley, thyme, and bay leaf) of your choice.
    b. Cool the liquid to room temperature or cooler.
5. Remove both chicken breasts from the refrigerator.
    a. Season one with salt and pepper (or your choice of seasonings), rewrap, and return to the refrigerator.
    b. Use a digital scale to weigh and record the weight of the second chicken breast. Then place the chicken in the brine into the refrigerator for 45 minutes.
6. Determine how the chicken breasts will be cooked: baked, grilled, deep-fried, pan fried, etc. Then set the oven, grill, or deep fryer temperature to preheat, and/or prepare pans for frying.
7. Remove both chicken breasts from the refrigerator. Remove the chicken breast from the brine and rinse it briefly under cold water. Pat it dry. Then weigh it, and record it again. Compare the brined weight to the original weight. Show the two weights below.
    a. Weight prior to brining: _____
    b. Weight after brining: _____
8. Cook both pieces of chicken in the identical way (baked at about 400°F, grilled, deep-fried, etc.). Use a meat or probe thermometer to check the temperature of the thickest part of the chicken. It is done when it registers 165°F.
9. Let the chicken breasts sit for five minutes before cutting. Then slice open and visually compare the amount of juice coming from each one. Taste both pieces. Then answer the following:
    a. Which had the most visual moisture? _____
    b. Which tasted moister? _____
    c. Which had the best taste? _____
    d. Describe the taste of the chicken you preferred (e.g., richer or sweeter).
10. Compare the overall data of the brined chicken weight, juiciness, and flavor. Did the theory and chemistry of brining prove to be true? Why or why not?