

## Chapter 8

# Eggs



Eggs are a nutrient-dense and low-cost source of **complete proteins**. In your professional practice, you will discover that there are many “egg myths” among consumers. For example, many people believe that the high-quality proteins in eggs are found only in the egg white, when actually, nearly half of these proteins are found in the yolk. The yolk also contains other important nutrients such as choline, folate, lutein, zeaxanthin, and vitamin D along with healthy monounsaturated and polyunsaturated fats. A second myth among consumers is that eating egg yolks will considerably increase their risk for heart disease because of the high cholesterol content in the yolks. However, intake of saturated and *trans* fats have more impact on blood cholesterol levels than intake of dietary cholesterol.

Understanding how to incorporate eggs into a healthy diet will be useful for you personally and professionally as you share your knowledge with consumers. It is important to educate consumers on the potential benefits of eating eggs. You will need to be knowledgeable about egg products, availability, nutrient composition, cost, functions, and preparation to best inform your clients and consumers.

 THINK ABOUT IT

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- ◆ List a few rumors you have heard about eggs. Then, list a few facts about the grading of eggs, nutrient composition, preparation, and/or the function of eggs in cooking.

Rumors:

Facts:

- ◆ List 3 things you would like to learn about food safety and sanitation or 3 questions you have relating to food safety and sanitation.

1.

2.

3.

**LAB ASSIGNMENT:**

# Breakout the Eggs

You have probably heard the American Egg Board slogan “The Incredible Edible Egg.” This slogan is not only catchy, but is very true. As you are about to find out, the egg is not only tasty on its own, but can provide many functional properties to food formulations. Let’s explore the incredible properties of eggs.

**Overview:**

All students will prepare hard boiled eggs, scrambled eggs, and scrambled egg substitute. In addition, each group will prepare an egg-based dessert. Students will also complete a recipe costing activity with this lab.

**Kitchen 1:** Hard boiled eggs, Scrambled eggs, Scrambled egg substitute  
Chocolate Angel Food Cake

**Kitchen 2:** Hard boiled eggs, Scrambled eggs, Scrambled egg substitute  
Chocolate Angel Food Cake

**Kitchen 3:** Hard boiled eggs, Scrambled eggs, Scrambled egg substitute  
Chocolate Soufflé

**Kitchen 4:** Hard boiled eggs, Scrambled eggs, Scrambled egg substitute  
Chocolate Soufflé

**Kitchen 5:** Hard boiled eggs, Scrambled eggs, Scrambled egg substitute  
Sponge Cake

**Kitchen 6:** Hard boiled eggs, Scrambled eggs, Scrambled egg substitute  
Sponge Cake

**Kitchen 7:** Hard boiled eggs, Scrambled eggs, Scrambled egg substitute  
Lemon Chiffon

**Kitchen 8:** Hard boiled eggs, Scrambled eggs, Scrambled egg substitute  
Lemon Chiffon

**Evaluation Tools:**

- Evaluation of Eggs
- Evaluation of Egg Desserts
- Costing Egg Dessert Recipe

**Directions:**

1. Always begin by washing your hands and thoroughly cleaning/sanitizing work surfaces.
2. Gather ingredients needed for hard boiled eggs, scrambled eggs, scrambled egg substitute, and assigned egg dessert recipe.
3. Prepare and taste the hard boiled eggs, scrambled eggs, and scrambled egg substitute. Complete your assigned dessert recipe.
4. Read “Egg Science” and “Egg Tips for Consumers.” Complete the “Egg Questions.”
5. When the desserts are done, taste a sample of each group’s egg dessert. Then, complete the evaluation tools.
6. Clean your work station and check out before leaving.

## RECIPES:

# Eggs and Egg-Based Desserts

## *Hard Boiled Eggs*

**Ingredients:**

1 large egg

Dash salt

**Method:**

1. Place a whole egg in a small saucepan.
2. Cover with cold water and add a dash of salt.
3. Cover with a lid. Place on medium heat.
4. Bring to a boil. Turn off the heat and let the pan sit on the hot burner for 15 minutes.
5. Remove the pan from the stove and immediately rinse the egg with cold water. Allow the egg to cool in the cold water for several minutes.
6. Crack and peel the egg.

## *Scrambled Egg*

**Ingredients:**

1 large egg

1 tablespoon milk

Dash salt

Few grains pepper, white

1/2 teaspoon margarine

**Method:**

1. Crack an egg into a small bowl, blend well with a fork. Add the milk, salt, and pepper.
2. Blend the ingredients with a fork or whisk until well blended but not foamy.
3. Melt the margarine in a small sauté pan.
4. Add the egg mixture to the hot pan.
5. Use a spatula to stir the egg mixture occasionally. Eggs are done after no liquid is visible. Take care not to overcook.

## Scrambled Egg Substitute

### Ingredients:

Eggs substitute, equivalent to 1 large egg	Dash salt
Few grains pepper, white	1/2 teaspoon margarine

### Method:

1. Place the egg substitute in a small bowl; blend well with a fork. Add the salt and pepper.
2. Blend the ingredients with a fork or whisk until well blended, but not foamy.
3. Melt the margarine in a small sauté pan.
4. Add the egg mixture to the hot pan.
5. Use a spatula to stir the egg mixture occasionally. Do not overcook.

## Chocolate Angel Food Cake

### Ingredients:

1/2 ounce cocoa powder	1 ounce warm water
1 teaspoon vanilla extract	6 ounces sugar, divided
1 3/4 ounces cake flour, sifted	1/8 teaspoon salt
8 egg whites	1 teaspoon cream of tartar

### Method:

1. Preheat oven to 350° Fahrenheit.
2. Combine the cocoa powder and the water in a bowl. Add the vanilla and set aside.
3. In another bowl, combine 2 1/2 ounces of sugar, the cake flour, and the salt.
4. In a medium-large bowl, whip the egg whites until foamy. Add the cream of tartar and beat to soft peaks (peak tips curl over and appear glossy). Gradually beat in the remaining sugar. Continue beating until the egg whites are stiff (peaks stand up straight), but not dry.
5. Whisk approximately 1/2 cup of the whipped egg whites into the cocoa mixture. Fold this into the remaining egg whites.
6. Sift the dry ingredients over the whites and fold in quickly, but gently.
7. Pour the batter into an ungreased tube pan and smooth the top with a spatula. Bake immediately until the cake springs back when lightly touched. About 40-45 minutes.
8. Remove the cake from the oven and immediately invert the pan. Allow the cake to rest upside down until completely cool.

# Chocolate Soufflés

## Ingredients:

2 cups orange juice	8 large eggs, separated
4 ounces sugar, divided	3 ounces flour, all-purpose
8 ounces semisweet chocolate, finely chopped	As needed extra sugar
As needed margarine or butter, melted	

## Method:

1. Preheat oven to 425° Fahrenheit. Place a sheet pan on the oven rack to bake the soufflés.
2. Heat the orange juice to lukewarm in a heavy saucepan.
3. Whisk the egg yolks and 3 ounces of sugar in a mixing bowl. Whisk in the flour and the warm orange juice and return to the saucepan.
4. Cook over medium-low heat, stirring constantly, until the custard is thick. Do not allow it to boil. Remove from the heat.
5. Stir in the chocolate until completely melted. Cover the mixture with plastic wrap.
6. Brush 8 small ramekins (about 6 ounces) with melted butter and dust with the extra sugar.
7. Whip the egg whites to soft peaks (peak tips curl over and appear glossy). Continue beating while gradually adding the remaining 1 ounce of sugar. Beat to stiff peaks. Fold 1/3 of whites into the chocolate mixture to lighten. Then, fold in the remaining whites and spoon into the prepared ramekins. Fill to within 1/4 inch of the top. Smooth the top. Place on the sheet pan in the heated oven.
8. The soufflés are done when well risen and the edges appear crusted or dry. The center should still be foamy. Takes about 15-20 minutes to bake. Announce to the class when the soufflés are done.

# Sponge Cake

## Ingredients:

3 ounces cake flour, sifted	6 1/2 ounces sugar, divided
5 large eggs, separated	3/4 teaspoon vanilla extract
3/4 teaspoon cream of tartar	

## Method:

1. Preheat oven to 375° Fahrenheit.
2. Line the bottom of a round 9-inch springform pan with parchment paper.
3. Sift the flour and 3 ounces of the sugar together and set aside.
4. Place the yolks and the whites in separate mixing bowls.
5. Whip the yolks on high speed for 3-5 minutes, until thick, pale, and at least doubled in volume. Whip in the vanilla extract.
6. Using a clean attachment, whip the egg whites until foamy. Add the cream of tartar and 1 tablespoon of sugar. Whip at medium speed until the whites are glossy and medium stiff, but not dry.
7. Pour the egg yolks onto the whipped whites. Quickly fold the two mixtures together. Sprinkle the remaining sugar over the mixture and fold lightly.
8. Sprinkle 1/3 of the sifted flour over the batter and fold in. Repeat with the remaining flour until all is incorporated. Do not over mix.
9. Pour the batter into the prepared pan, smoothing the surface as needed. Bake immediately for approximately 30 minutes.
10. Allow the cake to rest in its pan until completely cool.

# Lemon Chiffon

## Ingredients:

4 ounces cake flour, sifted	6 ounces sugar, divided
1 1/2 teaspoons baking powder	1/2 teaspoon salt
2 ounces vegetable oil	3 egg yolks
2 ounces water, cool	1 ounce lemon juice
1 1/2 teaspoons lemon zest	1 1/2 teaspoons vanilla extract
4 ounces egg whites	

## Method:

1. Preheat oven to 325° Fahrenheit.
2. Sift together the flour, 3 ounces of sugar, baking powder, and salt.
3. In a separate bowl, mix the oil, egg yolks, water, lemon juice, lemon zest, and vanilla extract. Add the liquid ingredients to the dry ingredients.
4. In a clean bowl, beat the egg whites until foamy. Slowly beat in the remaining 3 ounces of sugar. Continue beating until the egg whites are stiff, but not dry.
5. Stir 1/3 of the egg whites into the batter to lighten it. Gently fold in the remaining egg whites.
6. Pour the batter into an ungreased tube pan. Bake for about 1 hour.
7. Remove the pan from the oven and invert it to cool. Cool completely.

## EVALUATION OF EGGS

1. Taste each variation and place the numerical score for each characteristic in the upper left hand corner of each box. (Score System: 1=very poor; 2=poor; 3=fair; 4=medium; 5=good; 6=very good; 7=excellent)
2. Provide comments/descriptions to justify the numerical score.

VARIETY	COLOR/ APPEARANCE	CONSISTENCY/ TEXTURE	TENDERNESS	FLAVOR	OVERALL QUALITY
HARD BOILED EGG					
SCRAMBLED EGG					
SCRAMBLED EGG SUBSTITUTE					

## EVALUATION OF EGG DESSERTS

1. Taste each variation and place the numerical score for each characteristic in the upper left hand corner of each box. (Score System: 1=very poor; 2=poor; 3=fair; 4=medium; 5=good; 6=very good; 7=excellent)
2. Provide comments/descriptions to justify the numerical score.

VARIETY	APPEARANCE	CONSISTENCY/ TEXTURE	TENDERNESS	FLAVOR	OVERALL QUALITY
CHOCOLATE ANGEL FOOD CAKE					
CHOCOLATE ANGEL FOOD CAKE					
CHOCOLATE SOUFFLÉ					
CHOCOLATE SOUFFLÉ					
SPONGE CAKE					
SPONGE CAKE					
LEMON CHIFFON					
LEMON CHIFFON					

## COSTING EGG DESSERT RECIPE (THE VARIETY YOU MADE)

My Variety \_\_\_\_\_

1. List each ingredient, cost for amount purchased and unit purchased, and amount used in recipe in the table below. You will need to get a copy of the receipt from your instructor.
2. For each ingredient, calculate and record the cost for the amount used.
3. Calculate the total cost to prepare your egg dessert.

INGREDIENT	COST FOR AMOUNT PURCHASED AND UNIT PURCHASED	AMOUNT USED IN RECIPE	COST FOR AMOUNT USED
Total cost to prepare your egg dessert:			

## LEARN MORE:

## Egg Science

- ◆ Eggs have several unique properties that allow them to serve multiple purposes in food products. Eggs are used to **thicken, emulsify, clarify, bind, coat, leaven**, and even **color** food products. Eggs can also serve as an **interfering agent** or as the main ingredient.
- ◆ The egg yolk and egg white proteins **coagulate** when heated and can be used to **thicken** mixtures such as puddings or custards. Links between sulfur molecules and hydrogen molecules form when the proteins are heated, thus creating a gel. When used as a thickener, eggs should not be heated excessively as too much coagulation will cause lumps to form.
- ◆ **Emulsifiers** allow two substances to mix that normally do not. Lecithin in eggs is a phospholipid and a natural emulsifier that holds the egg yolk fats in the yolk mixture. Adding egg yolks to mayonnaise, salad dressings, or hollandaise sauce allows oil or fat to mix with vinegar or water.
- ◆ Eggs whites are used to **clarify** hot broths, coffee, wine, and other beverages. The raw egg proteins will coagulate in the hot beverage and trap any extraneous particles in the liquid. The egg and particles are then removed.
- ◆ Eggs are added to meatloaf and meatballs to **bind** or hold the ingredients together. The eggs are incorporated into the mixture and when heated coagulate to bind the ingredients.
- ◆ Eggs can enhance the appearance of pretzels, rolls, and cookies when brushed on as a **coating**. Bread coatings on chicken fingers and fish sticks often contain eggs which bind the coating to the meat.
- ◆ Eggs can function as a **leavener** in cakes and other baked goods. When whipped, tiny air pockets form and proteins surrounding each air cell coagulate, which provides a rigid and stable product. This action provides rise in products such as angel food cake and soufflés.
- ◆ **Color** is enhanced by the yellow carotenoids found in the yolk of eggs. It helps provide the desired golden color of the crust.

- ◆ When beaten, egg whites, yolks, and whole eggs will form **foams**. Air is incorporated into the eggs to create the foams. While yolks do not foam up as well as whites, their volume may increase by 2 or 3 times. These egg yolk foams may be used to make puffy omelets or sponge cakes. Egg whites can increase in size by 6 or 7 times and they may be used to make fluffy pancakes, meringues, angel food cakes, soufflés, and puffy omelets. These recipes may indicate to beat egg whites to soft peaks or stiff peaks. If soft peaks are required, beat the egg whites until the tips of the whites fall over when the beaters are removed. If stiff peaks are required, beat the egg whites until the tips of the whites stand straight up when the beaters are removed. Beating egg whites to soft or stiff peaks provides flexibility and rigidity for the product that is made. On the other hand, overbeating egg white foams will result in air cells breaking, producing a lumpy, inelastic foam that does not blend well with other ingredients and contributes to a poor quality product.
- ◆ Typically, egg foams are folded or gently mixed with the other ingredients to create a light, fluffy product. The volume and stability of egg whites can be affected by the addition of different ingredients:
  - Sugar delays egg white protein **denaturation** and increases the beating time.
  - Overbeating or beating until dry and cracked is prevented by the addition of sugar.
  - Salt can decrease the stability of egg white foams if they are not beaten long enough.
  - Fat decreases the volume and stability of egg white foams.
  - Acids, such as cream of tartar, can improve the stability of the egg white foam.
  - Water increases the volume of the egg white foam, but decreases the stability.
- ◆ Eggs can interfere with sugar crystal formation in divinity candy or ice crystal formation in ice cream due to their fat and protein composition.
- ◆ Eggs also serve as the main ingredient in many dishes such as scrambled eggs, hard boiled eggs, and omelets.

# Egg Tips for Consumers

- ◆ One egg is equal to 1 ounce from the protein foods group. Choose 5 1/2 ounces from the protein foods group every day (based on a 2,000 kilocalorie diet).
- ◆ Some consumers believe that brown eggs or white eggs are healthier. However, the color of an egg does not affect the nutritional value. The color depends on the breed of the chicken.
- ◆ When purchasing eggs, always look for clean eggs without cracks. Do not purchase eggs past their “sell by” date or “expiration” date. The “pack date” will appear on all USDA graded eggs; eggs should be sold within 45 days of this date.
- ◆ Eggs are usually safe to eat past their sell by date when stored properly, but should be eaten within 3 to 5 weeks of purchase. Always store eggs in the refrigerator promptly and keep them in the original carton. Do not leave eggs in the **temperature danger zone** for more than 2-4 cumulative hours.
- ◆ When using eggs in a recipe, be sure to cook or refrigerate them immediately. Refrigerated mixtures containing raw eggs should be cooked within 24 hours.
- ◆ Once an egg is cracked and separated, any unused portion should be refrigerated immediately. Leftover whites may be stored for 4 days and yolks for 1-2 days.
- ◆ When separating an egg white from the yolk, do not pass the egg back and forth between the two egg shell halves. The exterior of the egg shells can contain bacteria in its pores that can contaminate the egg. Instead, use an egg separator or funnel to separate the egg white from the yolk.
- ◆ Never consume raw eggs or foods prepared with raw eggs such as salad dressings, homemade ice cream, eggnog, or mayonnaise. You may consider purchasing pasteurized shell eggs which can be used safely in these homemade recipes. Infants, elderly, and individuals with weak immune systems should also be cautious of partially cooked eggs with runny yolks, such as fried or poached eggs, due to potential risk of getting a food borne illness. Fully cooked eggs are recommended for these groups.

# Egg Questions

1. You are having a fabulous dinner party and want to make a special dessert. You come across a terrific recipe for cake with a chocolate mousse filling. The recipe is as follows:

## *Chocolate Mousse Filling*

### Ingredients:

400 grams dark chocolate melted	4 dollops whipping cream
5 egg yolks	30 grams sugar
5 egg whites	1 shot cognac

### Method:

1. Melt chocolate and add 1 dollop of whipping cream and mix.
2. Add 5 egg yolks and 15 grams of sugar. Beat until foamy.
3. Beat 5 egg whites with 15 grams of sugar until a firm foam forms, add to mix. Finally, add 3 dollops of whipped cream and cognac, mix slowly, put all in a cold form, and refrigerate for 1 hour.

a. What is the problem with serving this mousse to your dinner party guest?

b. What will you do?



# Eggs Teacher Tips

## Overview

The function of eggs in food products include: emulsifier, foam, thickener, binding agent, interfering agent, structure agent, nutrient additive, flavoring additive, and cooking agent. Ensure the students recognized these functions in the different products they prepare.

- ◆ This lab experience will take a full class period of 2 ¼ hours to complete.
- ◆ Students will also experiment with egg substitutes.
- ◆ Students will investigate the characteristics of eggs cooked by different methods.
- ◆ Students will study the properties of egg white foams as affected by the extent of beating and adding ingredients.
- ◆ Students will prepare selected food products that utilize eggs as a principal ingredient.

## Lab Management

### Demonstrations

- ◆ Describe and/or demonstrate what egg foams should look like at soft peak (peaks flop over), stiff peak (peaks stick straight up), and over whipped (chunky and liquid forming at the bottom of the bowl) stages. One function of proteins in cooking is forming foams. Sugar stabilizes the foam.
- ◆ Caution students to gently fold in egg foams into their batter, but also make sure all of their ingredients are fully combined. Describe and/or demonstrate what **folding** in means. Eggs are gently folded into batters or other mediums, but need to be fully combined.
- ◆ Demonstrate how to make a cooked egg base for use in “safe” eggnog. Combine eggs and half the milk as indicated in the recipe you choose. Cook the mixture gently to an internal temperature of 160° Fahrenheit, stirring constantly. The cooking will destroy *salmonella*, if present. At this temperature, the mixture will firmly coat a metal spoon. After cooking, chill the mixture before adding the rest of the milk and other ingredients.

### Time Management

- ◆ Bring eggs for meringue to room temperature 1 hour before lab.
- ◆ Have each kitchen begin with their main egg recipe first. Then, while they are baking, groups can continue with the scrambled egg, egg substitute, and boiled egg recipes.
- ◆ Before students begin whipping their egg whites, they need to ensure any bowls and equipment are free from debris or fat residue. Whites will not whip into foam otherwise. If an eggshell or yolk breaks into the egg whites during separation, groups will need to start over. Groups may want to use two different bowls for separating yolks from whites in order to prevent having to throw away a large amount of egg whites. Remind students that factors such as temperature, pH, and additives can help or hinder the formation of the foam.
- ◆ Caution students not to over whip their egg foams or over heat their egg yolks if they use them in any recipe.

### Sensory Evaluation

- ◆ Instruct the students on how to display and when to evaluate the products. As time allows, a student from each kitchen should comment about the preparation of the dish and the final product.
- ◆ Evaluate at the same time, side by side: hard boiled egg, scrambled egg, and scrambled egg substitute.
- ◆ The characteristics of high quality raw eggs out of shell: Appearance: yolk stands high and firm above white; white has high ratio of thick, firm white and stands up; free from spots; flavor is mild egg flavor.
- ◆ Characteristics of high quality hard cooked eggs: Appearance: yolk is evenly centered in egg white; no dark ring; texture: yolk is dry and mealy; tenderness: white is firm to hold together offering only slight resistance to bite; flavor is mild, bland egg flavor.
- ◆ Characteristics of high quality scrambled egg: Appearance: egg masses appear slightly moist and creamy; consistency: even, all liquid is held by coagulated protein; tenderness: egg masses are tender white is tender and shows very little resistance to cutting or chewing; flavor is mild egg flavor.
- ◆ Evaluate the other egg dishes when ready.

**Nutrition Points for Discussion:**

- ◆ The Dietary Guidelines for Americans lists eggs as a protein food. The amount of protein per week varies from 10 ounces per week for a person who eats 1,000 calories to 34 ounces a week for someone consuming 3,200 calories per week. An egg is considered a one ounce equivalent. For a person following a lacto-ovo vegetarian food pattern, the USDA recommends between 1 and 5 eggs per week, depending on caloric intake.
- ◆ Eating approaches like the Mediterranean Diet and the DASH (Dietary Approaches to Stop Hypertension) Diet include eggs in the lean meats, poultry, and fish groups. One egg is 1 ounce equivalent.
- ◆ Discuss the function of fat in each of the recipes where it is used.
  - What is the role of mayonnaise in the deviled egg? Could you substitute with low fat Greek or other type of yogurt? How would it affect the nutritional value? How could you “stretch” the egg yolks so you could use fewer, but still have enough filling for the whites?
- ◆ Salt has either been eliminated from the traditional recipe or listed as optional. Discuss with the students the function of salt in these recipes.

## SHOPPING LIST: (8 SECTIONS)

Item	Utilized Unit/Lab Section	Purchased Unit
Lemon zest	3 tsp.	4 lemons
Lemon juice	2 oz	1 bottle
White pepper	TT	1 cont.
Cocoa powder	1 oz	1 cont.
Cake flour	17 ½ oz	1 box
Semisweet Chocolate	16 oz	1 box
Salt	1 ¼ tsp.	1 cont.
Vanilla	6 ½ tsp.	1 bottle
Sugar	3 lbs	(1) 5 lb bag
Cream of Tartar	3 ½ tsp.	1 cont.
Baking powder	3 tsp.	1 cont.
All-purpose flour	6 oz	(1) 5 lb bag
Vegetable oil	4 oz	1 sml. bottle
Eggs, large	66	(4) 18 count.
Egg substitute	2 cups	1 cont.
Orange juice	4 cups	1 quart
Milk	8 TBSP	1 pint
Margarine	5 TBSP	1 box