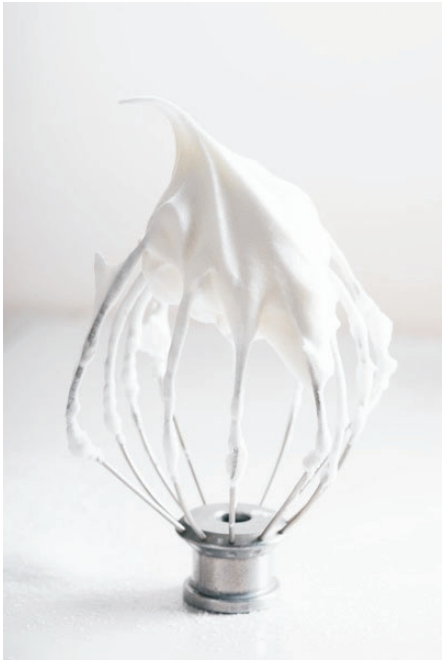
Foam Cakes: Ingredients and Preparation

ARE TWINKIES® a foam cake? Foam cakes are generally feather-light with many variations, including angel food, Boston cream, chiffon, génoise, jellyrolls, ladyfingers, meringues, and many more. Foam cakes three main ingredients are eggs, sugar, and flour. Although you might not understand the science that transforms these limited ingredients into cakes, you need to understand processes, ingredients, and mixing methods in order to make them. With foam cakes, air bubbles are a vital part of leavening within the batter. The bubbles (foam) come mainly from beating eggs. These beautiful, whipped egg whites (illustrated here) help create spectacular foam cakes.



Objective:

Prepare foam cakes using your knowledge of the basic ingredients, equipment, tools, and mixing methods.

Key Terms:

all-purpose flour
angel
angel-cake method
bain-marie
baker's percentage
biscuit
Boston cream pie
cake flour
chiffon
chiffon method
citrus zest
clarified butter
cream of tartar
dacquoise
double boiler
foam cake (unshortened cake)
fold
formula
ganache
génoise
gluten
ladyfingers
leavened
meringue
meringue cake
meringue shell
mise en place
mixing
nut flour
pavlova
petit fours
recipe
ribbon stage
roulade
saccharide
salt
salted sweet cream butter
scaling
sponge
sponge method
torte
trifle
triglyceride
unsalted sweet cream butter
vegetable oil

Foam Cakes: Types, Equipment, Ingredients, and Preparation

A **foam cake (unshortened cake)** is a light, airy, spongy cake with little or no fat. They have a high proportion of eggs to flour and are leavened primarily by air beaten into whole eggs or egg whites. Foam cakes include sponge, chiffon, meringue, and génoise. Primarily, foam cakes are **leavened** (made to rise) by whipped eggs and steam. The three most important ingredients in a foam cake, in order of importance, are eggs, sugar, and flour. Most foam cakes are drier than butter cakes, because they contain little or no butter or oil. [NOTE: Exceptions include chiffon and most génoise cakes. Also, this lesson addresses baking foam cakes from scratch with recipes. Handling quantity foam cake mixes, in formulas, is a science unto itself. You will learn the terms associated with formulas, but all cakes will be evaluated as recipes. All measurements for cake pans will be in inches unless otherwise stated.]

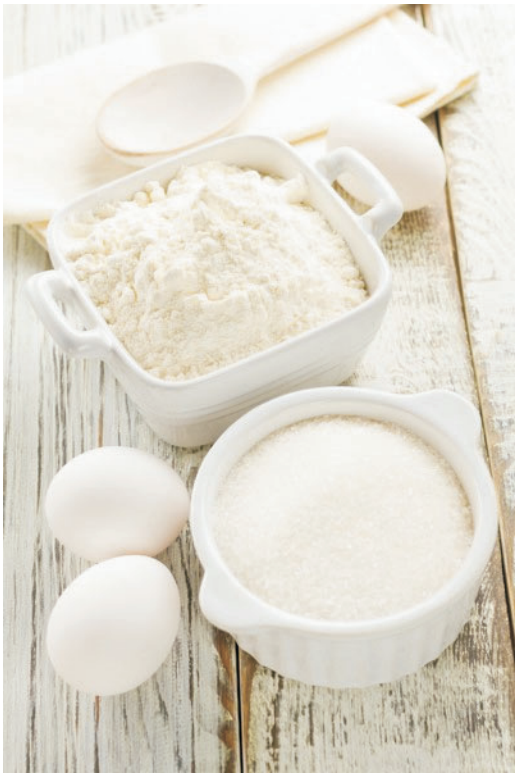


FIGURE 1. The three most important ingredients in a foam cake, in order of importance, are eggs, sugar, and flour. Foam cakes include sponge, jellyroll, chiffon, angel food, meringue, and génoise.

FOAM CAKE TERMS, INGREDIENTS, AND EQUIPMENT

Baking is science. Bakers use formulas to ensure consistent products. A formula is a general science and math construct that shows the relationship between given quantities. In baking, a **formula** is the written measurement of ingredients by weight (in pounds, ounces, kilograms, or milligrams). Weight measurement is essential when flours and sugars (anything sifted) are added to a baking formula. In contrast, a baking **recipe** is the written measurement of ingredients by volume, such as teaspoons, tablespoons, cups, dashes, and pinches—which are perfectly fine for small batches. To appreciate the interaction of these ingredients, there are specific terms and characteristics associated with all parts of the cake recipe that should be considered.

Scaling

Scaling is a baker's term for weighing out ingredients. Accurately measuring 4.54 cups of cake flour by volume is, at best, a guess, whereas accurately weighing 1 pound of cake flour is precise. In baking and pastry formulas, all ingredients are based on percentages (ratios), and the percentages are what allow the baker to scale the batter up or down (doubling, tripling, etc.) in quantity.

Baker's Percentage

A **baker's percentage** (formula percentage) is the percentage of an ingredient in relationship to the amount of flour in the formula. For example, 1000 grams of flour, 660 grams of water, 20 grams of salt, and 10 grams of yeast are expressed in a baker's percentage as 100 percent flour, 66 percent water, 2 percent salt, and 1 percent yeast. In a baker's formula, all amounts are expressed in percent of the total flour weight; although, it is actually a ratio, as the percentages always add up to more than 100 percent.

If a formula calls for 4 pounds of flour, then 4 pounds equals 100 percent. In the same formula, 2 ounces of baking powder equals 3.1 percent of the total flour weight. [NOTE: Got to the King Arthur Flour webpage, "Ingredient Weight Chart," at http://www.kingarthurflour.com/learn/ingredient-weight-chart.html.]

A drawback to a baker's percentage is that gluten-forming flour proteins are not reflected in the formula. This can have an impact on the final product, so it may need to be adjusted. There are, however, many reasons to use a baker's percentage.

- It enables the baker to work with more precision (with only one unit of measure).
- It is easy to scale a formula up or down (doubling, tripling, etc.).
- It is easy to compare which formula is drier, sweeter, or saltier.
- The baker's percentage helps create uniform ingredient measurements for varying quantities per unit. (For example, 70 grams may be the weight of one to three eggs, depending on their size.)
- It also serves as a common language among all bakers and baking operations.

Egg Basics

Eggs are the most important ingredients in a foam cake. Eggs (combined with flour) are a structural element in baking. Chicken eggs are the standard. All other types of eggs (duck, ostrich, etc.) are rarely used in baking and pastry formulas. Eggs are a valuable source of vitamins A, B, and D.

Grade AA large eggs (about two ounces each, or eight per pound) are the most common size used in baked goods. Eggshell color does not affect how the egg functions in baking and pastry products.

Egg weight is more accurate than the number of eggs used.

- One Large Egg White: About $1\frac{1}{3}$ ounces or $2\frac{2}{3}$ tablespoons
- One Large Egg Yolk: About $\frac{2}{3}$ of an ounce or $1\frac{1}{3}$ tablespoons
- Eight Whole Large Eggs: About 1 pound or 2 cups

A fresh egg should have a nicely rounded yolk that is well centered in the white, and the egg, still in its shell, should sink to the bottom of a water-filled container (good way to check freshness). Cracked eggs have a danger of salmonella and should be discarded.

Egg Functions

Eggs provide many functions in the baking process.

- *Leavening:* Via air incorporation, egg whites contain lecithin, a protein that lines the outside of the air bubbles created during beating. These bubbles prevent the egg whites from collapsing.
- *Emulsification:* Eggs act as a binding agent that holds other ingredients together. Eggs are second to flour in providing structure to baked goods.
- *Moisture:* Eggs keep batters moist without having to add other liquids (which might make the batter too thin or collapse).
- *Color:* Egg yolks provide color to batter. An egg wash provides a glaze to baked goods that browns the surface (the Maillard reaction).
- *Flavor and Texture:* Eggs add a distinctive taste to baked goods. The addition of yolks makes baked goods more tender. Eggs act as a thickening agent and provide texture.

Egg Temperature

Eggs are easiest to separate when they are cold. To beat whole eggs or egg whites to their greatest volume, they should be brought to an internal temperature of 65°F to 75°F. Angel food cakes use only egg whites in the batter. Sponge and chiffon cakes beat egg yolks and egg whites separately. The egg white foam (or meringue) is folded into the batter.

FIGURE 2. In foam cakes, egg whites, egg yolks, or whole eggs are whipped to form air bubbles that leaven the cake. Notice the foam in the beaten eggs. Is this baker whipping egg yolks or whole eggs? How can you tell?

Sugar Basics

Sugar is the second most important ingredient in a foam cake. Sugar is a carbohydrate that is soluble in water, usually crystalline in form, and sweet in taste. Sugars are produced from various types of plants, such as canes (sucrose), beets, sugar maples, and palms. In fact, most fruits and vegetables contain sugar (sucrose or fructose). Solid sugars include cane and beet sugars. Liquids can include honey, molasses, corn syrup, or various manmade liquid sweeteners produced for dietary purposes.

Saccharide

Saccharide is the scientific name for sugar (or an organic compound containing sugar). Sugars and other sweeteners add taste, tenderness, color, and aroma to baked goods. [NOTE: Reducing more than one third of the sugar in a recipe will negatively affect the tenderness,

moistness, brownness, and sweetness of the product. It may also change some of the scientific reactions that occur during preparation.]

Grinds

The various grinds of solid sugar (such as granulated, powdered, superfine, or brown) impact finished products. Most baked goods are produced with the solid sugars. Superfine sugar is most often used in foam cakes. When baking, liquid sugars do not react in the same fashion as solid sugars. Consult a reference guide when substituting liquids for solids. [TIP: It is possible to mimic superfine sugar (also called caster or castor sugar) by processing granulated sugar in a food processor. After 30 seconds to a minute, the sugar should become finely ground, and it is then acceptable for use in foam cakes.]

Weight

Sugar by weight is more accurate than sugar by volume.

- A cup of granulated sugar is about 7 ounces.
- A cup of confectioners' (powdered) sugar is about 4 ounces.
- A cup of packed brown sugar is about 7½ ounces.
- A cup of molasses, honey, or corn syrup is about 12 ounces.

Sugar Functions

Sugar has many functions within cake batters, including flavor, tenderization, color (caramelizes and aids in browning), the feeding of yeast organisms (aids in fermentation), moisture retention (sweetened goods stay moist longer than unsweetened types), and the spreading of cake batter and cookie dough. [NOTE: Artificial sweeteners do not provide the same browning, tenderizing, and moisture retention as natural sugars.]

Flour Basics

Flour is the third most important ingredient in a foam cake. However, flour is not used in meringue cakes or in flourless cakes. All-purpose wheat flour (mixed from hard and soft wheat) is the most commonly used flour for baked goods in the United States. French flour is made from soft wheat. Both hard and soft wheat contain very little germ or husk, and they keep longer than whole meal-type flours. Varying protein content affects the way flours react, so some dessert and pastry recipes may call for 2½ to 2¾ cups. In this case, the process is to measure and add smaller amounts first. Then, following the recipe directions, more flour can be added to create the desired condition (cleans the sides of the bowl, not sticky to the touch, etc.). However, foam cake recipes typically call for a specific amount of flour, such as 2½ cups.

Gluten

Gluten is an elastic protein found in wheat and cereal flours that gives batter and dough elasticity, strength, and rising ability. (It keeps baked goods from collapsing when removed

from the oven.) Gluten stretches (when moistened) and expands to hold the gas produced by the leavening agent. It becomes a structural framework for baked products.

Wheat Types

The type of wheat (hard or soft) affects the amount of gluten content. Hard wheat (grown in the Midwest) has a high protein content and, as a result, produces more gluten. Soft wheat (grown in the South) has less protein content and produces less gluten. Baked products require different gluten content. Cakes, quick breads, and pastries require much less gluten formation (for a soft, fine texture) than yeast breads.

Flour Functions

Flour adds, provides, and/or creates body (bulk or mass), structure, texture (tender and crumbly or firm and chewy), flavor, and gluten within the baked item.

Flour Types

The following flours are typically associated with cakes.

All-Purpose Flour

All-purpose flour is a blend of hard and soft wheat that can be bleached or unbleached. It is the most common flour used in the United States, and it is made up of 8 to 11 percent protein (gluten). It is used for quick breads, pastries, and some cakes. Flour that bleaches naturally (usually via oxygen) is called "unbleached," and flour that is chemically treated (by chlorine, bromates, or peroxides) is termed "bleached flour." Bleached flour has less protein than unbleached.

- In Europe, these chemicals are not allowed in flour.
- Bleached flours are best for pie crusts, cookies, quick breads, pancakes, and waffles.
- Unbleached flours are best for yeast breads, Danish pastry, puff pastry, strudel, éclairs, cream puffs, and popovers.
- Unbleached flour in the United States may still have been treated with a bromate. Read all ingredients carefully, or go to company websites for milling information.

Cake Flour

Cake flour is a finely-ground, soft-wheat flour with a high starch content. It is bleached with chlorine to allow it to absorb more water, which produces a fine, white crumb in cakes. Bleaching makes the flour slightly acidic. This has two effects: It sets the cake batter faster, and it distributes fat more evenly than other flours, which improves the texture. Cake flour is $7^1/_2$ percent protein (gluten). Its low gluten count produces tender cakes. Baked goods with a high sugar ratio benefit from the use of cake flour, because it is able to rise without collapsing (more so than products produced with all-purpose or other wheat flours).

Foam cakes need high-starch, low-protein flour, so most call for cake flour. However, some recipes for rolled sponge cakes (roulades) use high-protein flour and add ground nuts or cocoa powder to the batter for added structure and stability. [NOTE: In a pinch, two tablespoons taken from a cup of wheat flour can be a substitute for cake flour.]

Nut Flour

Nut flour is made from finely ground nuts, and it can be used to bake breads, cookies, cakes, and, especially, pastry crusts.

Other Flour Facts

Flour is often used to prepare pans for cake batters and other baked goods to prevent sticking. Preparing a pan for baking often requires a greased pan to be lightly coated with flour. That pan is then tapped to remove any excess flour. Some baking sprays already contain flour for this purpose.

All flours are different, and they work best when weighed. [NOTE: For information about measuring flour by volume see the "How to Measure Flour" video at http://www.kingarthurflour.com/learn/how-to-measure-flour.html.]

FIGURE 3. Some foam cake recipes require that flour be sifted before measuring. In recipes that call for sifted flour, take the following steps: Stir flour to aerate; sift it into a cup or on a scale; and gently level off the cup with a straight edge. All flour types are most accurately measured by weighing.

Salt Basics

Salt is a crystalline compound (NaCl, sodium chloride), primarily used as a condiment, that comes in two types—sea salt distilled from seawater and rock salt found in the earth. Sodium chloride (table salt) was the first salt discovered by humans. Iodized salt (table salt with added iodine) is the salt most often utilized in American cooking.

Salt Functions

Salt has many functions within cake batters.

- Flavor (heightens the flavor of other ingredients, balances sugar)
- Slows yeast fermentation, keeping air bubbles small and uniform in size (not good for most foam cakes)
- Toughens the texture of soft fat-and-sugar mixtures
- Strengthens gluten protein (better texture)

Leavening Basics

Leavening is the production of gas in a dough or a batter through an agent, such as steam, air, eggs, baking soda, baking powder, a starter, or yeast. The leavening agent causes expansion in batter by releasing gases within the mixture. Chemical leavening agents (baking soda and baking powder) produce CO_2 gas that helps products rise. Leavening is important in baked goods. Not only does it cause a baked product to rise, but it provides added flavor. [NOTE: Leavening agents are discussed in detail in CA C8–2, "Leavening Agents."]

Steam

While baking, moisture from batter is converted to steam. Foam cakes use steam as part of their leavening and lift. [TIP: Preheating of the oven encourages the greatest production of steam leavening.]

Air

Mechanical incorporation of air occurs during batter (dough) mixing, such as whipping, beating, or folding. Air leavening occurs when this vigorous mixing entraps air, creating bubbles that produce foam. Air leavening, from beaten eggs, is the most common leavening agent in a foam cake.

Chemical

Chemical leavening agents (baking soda, baking powder) produce a gas that helps the product rise. Chemical leavening agents are used sparingly in foam cakes. Some chiffon and génoise cakes use a chemical leavening agent. [NOTE: For a sponge cake recipe that uses a chemical leavening agent (baking powder), go to the Natasha's Kitchen website. A recipe and a short video, "Four-Ingredient Sponge Cake," can be seen at http://natashaskitchen.com/2016/05/06/easy-sponge-cake-genoise/.]

Baking soda (sodium bicarbonate) is a chemical leavener when combined with an acid. It creates tiny bubbles of carbon dioxide that push against the batter and cause it to expand (leaven, rise). Baking soda reacts with liquids, including sour milk, yogurt, buttermilk, sour cream, and molasses. Because baking soda only reacts once (single-action), it is often added to the dry ingredients first. Then, when wet and dry ingredients come together, the cake must be panned and baked as quickly as possible. [TIP: Mise en place is essential when using baking soda.]

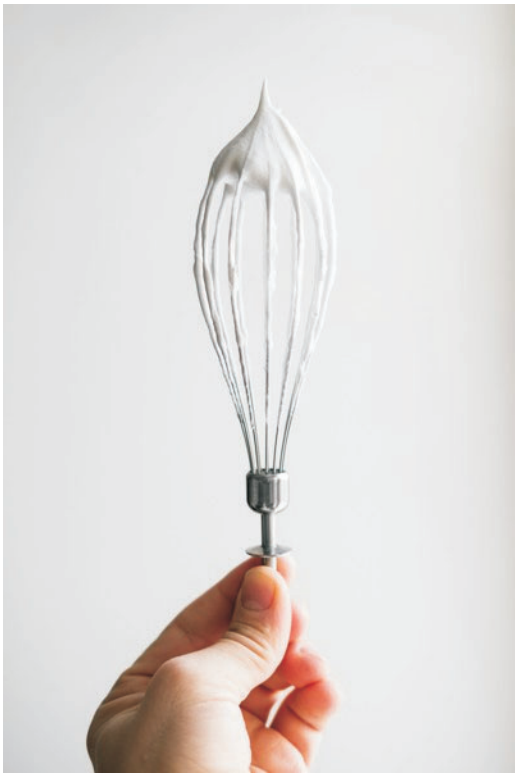


FIGURE 4. Air leavening from beaten eggs is the most common leavening agent in a foam cake. Is this beaten egg white considered a soft peak or a stiff peak? How do you know?

Baking powder is a chemical leaven composed of baking soda, a dry acid (such as cream of tartar), and a starch (such as cornstarch) to prevent lumping. Because of the added acid, baking powder will react on its own when wet. For baking powder leavening to occur, two elements must be available—an acid and an alkaline—that react separately in the presence of moisture. This combination forms gases (tiny bubbles in the batter) that expand for leavening. The most common form of baking powder is a double-acting variety, which has two dry acids. In double-action, the first acid reacts in the cold (room temperature) batter, and the second one reacts in the oven at an approximate temperature of 140°F. This ability to react twice makes baking powder a good choice for most baked products.

Liquid Basics

Foam cake recipes use very little liquid. The liquids most used in foam cakes are water, juices, and oils. Liquids are needed for chemical changes in structure and texture. When liquid evaporates under the dry heat of an oven, it produces steam. In turn, air bubbles develop and increase the volume of the baked good. Like eggs and flour, liquids are more accurate when weighed. (Two cups of water and two cups of molasses are the same volume but different weights.) The metric system is preferred for measuring liquid, as it does not differentiate between fluids and solids—a gram is a gram and a kilogram is a kilogram.

Liquid Functions

Liquids have many functions within baked goods.

- Moisture
- Flavor (milks, creams, fruits, juices, yogurt, or sour cream)
- Added color (browning from milk and fruit sugars)
- Leaven with steam
- Hydrate proteins, starches, gelatins, and leavening agents
- Activate yeast organisms
- Mix with flour for proper gluten development
- Aid in binding (especially in quick breads and muffins)

Fat Basics

Fats are plant- or animal-based, oily ingredients that melt at low temperatures. Fats are compounds of carbon, hydrogen, and oxygen. Lipids are molecules that include fatty acids, triglycerides, cholesterol, and various nutrients. Fats are lipids found in animal and vegetable tissue. (From animals, butter and lard are produced. From vegetables, nuts, legumes, oils and shortenings are made.) Solid fats (butter, margarine, and hydrogenated products) remain solid near room temperature. Oils can solidify when refrigerated or cooled.

A byproduct of creating hydrogenated shortenings is the production of trans-fatty acids (trans fat) that may cause a health risk. Shortenings are 100 percent fat. A half-and-half split

with butter is a good shortening mixture. Three common fats may be used to make foam cakes.

Vegetable Oil

Vegetable oil is fat extracted from plants, fruits, or seeds. Examples of vegetable oils are coconut, corn, cottonseed, olive, palm, rapeseed (canola), safflower, soybean, and sunflower. Oils are liquid at room temperature, but when refrigerated, they may solidify. Vegetable oil is a triglyceride. A **triglyceride** is an ester derived from glycerol and three fatty acids, and it is the largest class of fats represented in the human diet. [NOTE: For more information about the properties of fat, see the MYcaert lesson and e-unit for CA B3–5.]

Butter

Salted sweet cream butter is a dairy product that is churned (agitating cream to separate fat and water) from fresh, sweet cream, has an 80 percent fat content, and has been flavored with salt. European butters can contain up to 86 percent fat. **Unsalted sweet cream butter** (same as the salted variation, minus the salt) is used in many sweet or low-sodium recipes. Water and some milk solids comprise the remainder of butter's contents. Butter is different from shortening in two major ways. It has an enhanced flavor and melts in the mouth.

Clarified Butter

Clarified butter is butter fat that has been rendered by separating the milk solids and water from the butterfat. Most commercial butter is 80 to 82 percent fat, 16 to 17 percent water, and 1 to 2 percent milk solids. Clarified butter is prepared by melting butter, and skimming the milk solids off that float to the top or sink to the bottom (as the water evaporates). The remaining butterfat is the clarified butter. The high percentage of water in solid butters creates a lower smoke point. Clarified butter and most oils can be heated at higher temperatures without smoking. As clarified butter is close to 100% butterfat, the lack of water (which encourages spoilage) allows it to be stored for extended periods of time.

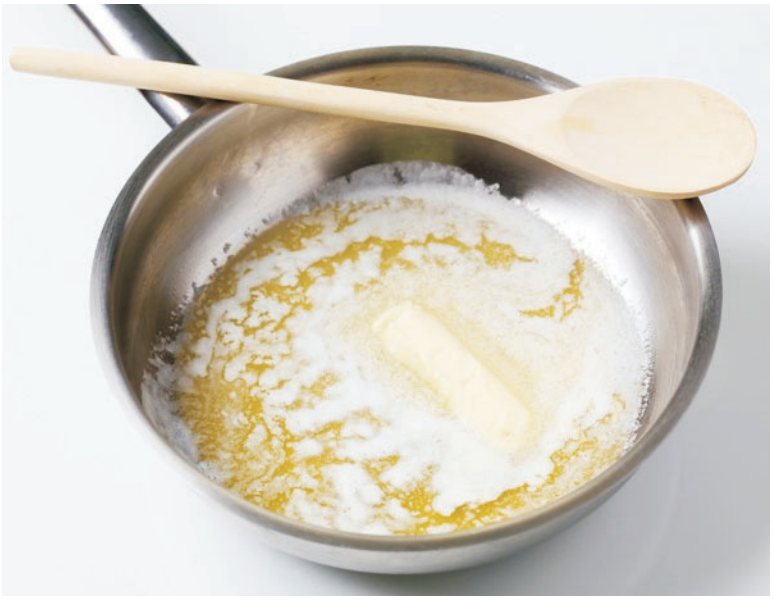


FIGURE 5. Clarified butter is prepared by melting butter, and then skimming the milk solids off that float to the top or sink to the bottom (as the water evaporates). The remaining butterfat is the clarified butter. Notice the milk solids floating on top of the partially melted butter.

Fat Functions

Fats provide many functions in a cake, including flavor and richness (especially butter or lard), moisture, tenderness (shortens

gluten strands), leavening (when creamed), browning, emulsification, and an even distribution of added flavors (vanilla, almond, etc.) throughout the batter.

Flavorings and Other Added Ingredients

In small quantities, flavorings and aromatics can add something special to a cake. Flavorings may include extracts (concentrated oils or essences diluted with alcohol), natural liquids (such as vanilla, almond, or cherry, also derived from concentrated oils), seeds and beans (vanilla, nutmeg, chocolate, coffee), and spices (like cinnamon, ginger, cloves, or nutmeg). Chiffon cakes are often flavored with **citrus zest** (the grated or finely-cut, outer skin of lemons, limes, oranges, and other citrus fruits). Sponge, chiffon, angel, and génoise cakes can also be flavored with cocoa powder and numerous fruit flavors.

Other common ingredients can include citrus (and other juices), nuts, chips, coconut, cherries, apples (and other fruits), chocolate, and vegetables. Foam cakes are often filled with a custard or a sweetened, whipped-cream filling layered with a combination of these and other ingredients.

FIGURE 6. Lemon, lime, orange, and other citrus skins are used to make citrus zest. Notice, the white pith is not considered zest. The pith is the white covering found between the skin and a citrus fruit's segments.

Cream of Tartar

Cream of tartar (potassium bitartrate) is an odorless, white, crystalline powder with a chemical formula of $KC_4H_5O_6$. Cream of tartar is added to egg whites, while whipping, to increase their volume and stabilize their peaks. Cream of tartar is a byproduct of winemaking. Potassium bitartrate crystallizes during grape fermentation, and it is scraped from the inside of wine barrels. It is found in the baking and spice aisle of most grocery stores. To substitute for cream of tartar, combine a ½ teaspoon of lemon juice or white distilled vinegar per egg white.

Basic Hand Tools and Equipment

Basic hand tools and equipment are necessary for creating a well-mixed, balanced, and evenly-baked item.

Mixer

Stand mixers sit on a tabletop or the floor and have several attachments (flat beater, dough hook, or wire whip). Foam cakes may use the flat beater, but wire whips are used to beat egg

whites. Egg yolks are beaten separately for chiffon cakes. Use the flat beater or the wire whip as directed.

Scales

Platform, digital, or balance scales are used to accurately measure ingredients. Platform scales are often used to measure moist ingredients, and balance scales measure dry ingredients. Digital scales are best to measure small amounts (spices, herbs, leavening agents) or portions (such as two ounces of batter per cupcake).

Spatulas

Numerous spatulas are available, with most used for stirring, scraping, or icing. Wooden spatulas are very practical for stirring. The flat surfaces easily scrape off the edge of a pan. Also, egg mixtures (such as custard fillings) can be prepared with a wooden spatula.

Rubber scrapers are used to remove all traces of dough and batter from a bowl or vessel. They are also used to gently fold beaten egg whites or meringue into a batter or dough.

Metal icing spatulas (straight and offset) are used to ice many types of cakes.

Cutting Boards

Marble, polyurethane, and wooden cutting boards are used to protect table surfaces and reduce contamination.

Knives

Paring knives are used for trimming. Chef knives are used to chop, section, or split. Slicers are used to section cakes and to trim edges from bar cookies.

Hand Whips

A metal-handled, multi-wire whisk is used to incorporate air into various products, such as eggs or heavy cream.

Wooden Spoons

Large wooden spoons are used in creaming, cake-batter mixing, and folding operations. Chefs and cooks often prepare chocolate mixtures, sauces, and glazes with a wooden spoon.

Sheet Pans

Straight-sided pans (full, half, and three-quarter sizes) are used to bake sheet cakes, pan cookies, or sponge cakes.

Jellyroll Pans

These straight-sided pans (15½ × 10½ × 1) are used to bake sponge cakes, especially jellyrolls.

Rectangular and Square Pans

Rectangular (9 × 13 × 1.5) and square (8 × 8 × 1.5) are common household pan sizes. These are primarily for small sheet cakes that are served directly from the pan.

Layer-Cake Pans

Layering pans are typically round, but could be square, rectangular, or other shapes. (They can vary up to 18 inches, but 9 × 9 × 2 or 3 is common.) Professional layer pans are used to make all types of two- and three-layer cakes. Some have loose bottoms for easy cake removal. Special filled foam cakes are baked in round layer cake pans.

Loaf Pans

Loaf pans (9 × 5 × 3 or 10 × 4 × 3) are used for baking pound cakes, fruitcakes, and breads. Some angel food cakes are baked in loaf pans and sold commercially.

Tube Pans

These pans (9 × 3 is common) are used to make angel food cakes, Bundt® cakes, and chiffon cakes. Sometimes, these pans are fluted. Bundt® cakes are normally made with a butter cake batter; however, many chiffon cakes are baked in Bundt® pans due to the added fat or oil.

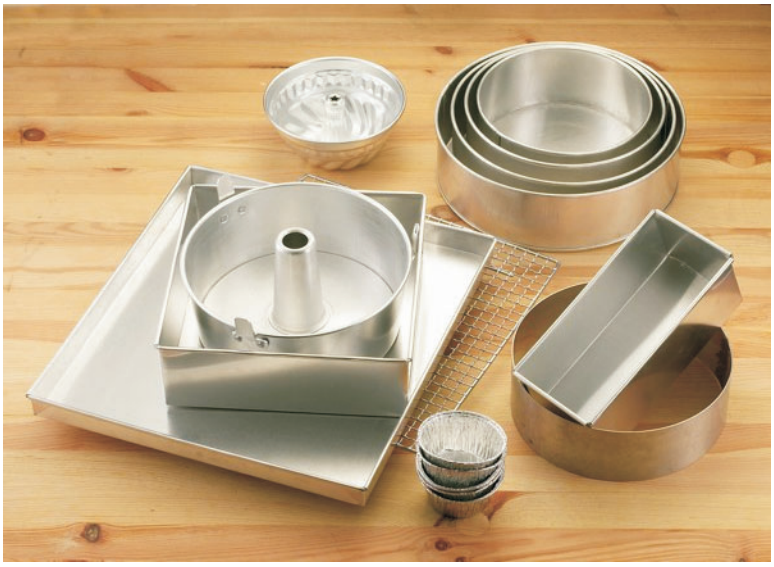


FIGURE 7. Based on their descriptions, identify these baking pans.

Springform Pans

Springform pans (9 and 10 are common) have hinged sides and a removable bottom. They are typically used to bake cheesecakes, layered cakes, or frozen desserts.

Scoops

Scoops (or dippers—resemble ice cream scoops) come in many sizes. Scoop numbers generally correspond to measures. Portions are based on a number of leveled scoops. [A scoop number of 100 means that 100 portions are found in a quart of batter. A scoop numbered 12 (each scoop contains a scant ½ cup) is typically used to portion cupcakes.]

Liners

Disposable parchment paper and reusable silicone pan liners are used in conventional, convection, and microwave ovens. Pan liners make cake layers easy to remove from pans. Silicone liners are reusable.

Double Boiler and Bain-marie

A **double boiler** is a saucepan that is made up of two pans that nestle together—the bottom pan is filled half full (or less) with simmering water, and the top pan holds the ingredients. Typically, the top pan does not touch the simmering water.

A **bain-marie** is a hot water bath ("bain" is the French term for bath) used to slow cook foods or keep them warm. In many foam cake preparations a bain-marie is used to hold or melt an ingredient over simmering water. [NOTE: The Spruce Eats website has an example of a bain-marie that can be seen at https://www.thespruce.com/definition-of-bain-marie-480588.]

PREPARING FOAM CAKES

Many tasks, steps, ingredient preparations, tools, equipment pieces, and types should be discussed when preparing a foam cake.

Mise en Place

Before mixing, the baker must follow the rules of mise en place. **Mise en place** is a French cooking term that means "to set up" or "to arrange." The baker should:

- Read the entire recipe.
- Collect all of the ingredients and allow them to come to room temperature (with the exception of heavy cream, which should usually remain refrigerated until use).
- Measure all ingredients accurately, preferably by weighing.
- Follow processes requested by the recipe. This might include chilling a stainless steel bowl in the freezer (to whip heavy cream), ensuring ingredients are at room temperature, or pre-cooking/pre-cutting added ingredients (such as fruit compotes, toasted spices, or nuts).
- Prepare the workstation by cleaning the area, gathering tools (cutting board, knives, etc.), and arranging equipment (such as a stand mixer) as required.
- Preheat the oven.

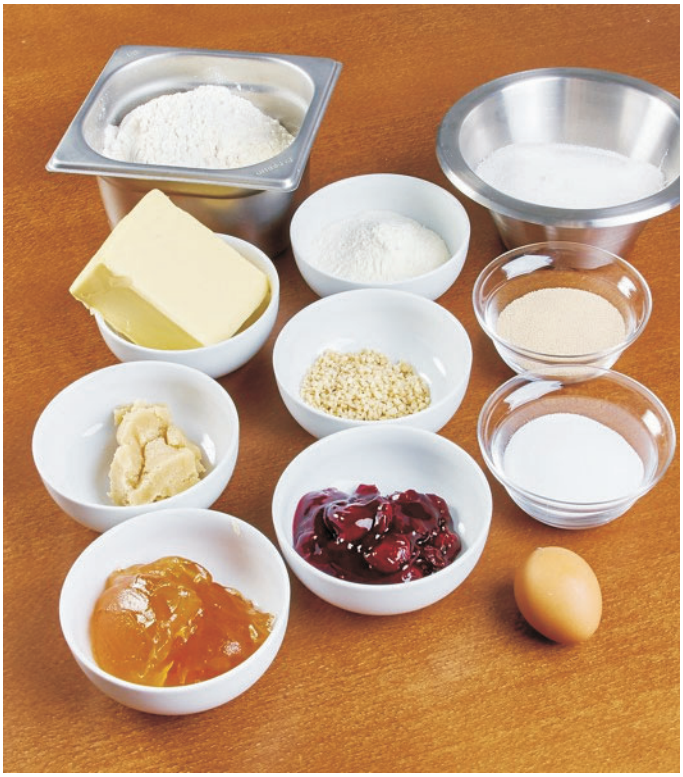


FIGURE 8. Follow mise en place rules by having all equipment, tools, and ingredients ready to begin baking (without having to take any extra visits to the pantry!).

- Prep baking pans. (For example, the recipe may call for the baker to grease the pan, add parchment paper, or grease a liner).
- Make a cooling station (a clear area with cooling racks, etc.).

Cake Pan Prep

Different cake pans, recipes, and batter ingredients require different pre-baking preparations.

Ungreased

Angel, chiffon, and most sponge cakes are baked in ungreased pans. During baking, the batter expands up the sides of the ungreased pan for support.

Greased

Lard or solid vegetable shortening, such as Crisco® or lard (not butter, margarine, or sprays), is applied to the inside of layer, Bundt®, tube, loaf, square, and rectangular cake pans. The shortening can be spread with fingers, a pastry brush, or a paper towel. Shortening tends to release cakes easier than other fats.

Greased and Floured

First, grease the pan. Then, sprinkle about one teaspoon of flour into the pan while tapping and turning it—until the flour adheres to the greased bottom and sides. Flip the pan over and tap out the excess flour. Recipes that use fluted tube pans usually direct you to grease and flour the pan. [NOTE: Cakes served from a pan would not require flouring.]

Grease, Parchment Paper, and Grease

The grease, parchment paper, and grease method is especially desirable when baking tender layer cakes. The process for a baker is as follows:

- Lightly grease the layer pan.
- Add a parchment or silicone liner.
- Grease the parchment or silicone liner.
- To remove layers from the pan, loosen any cake that clings to the sides of the pan. Turn over the pan onto a

FIGURE 9. Which of the following cake pan preparation techniques is illustrated here? For which foam cake is the cake pan prep technique suitable? Could you use spray oil rather than bottled oil on a pastry brush? Explain your responses.

rack, a plate, or your hand. The greased parchment or silicone layer ensures that the cake layer comes out cleanly.

Greased and Sugared

In this method, you would follow the grease and flour method, but substitute sugar for flour. Some recipes for angel cakes use this technique. The heated sugar allows the cake to more easily release, and gives the cake a crisp, sugary crust.

Non-Stick Pans

Non-stick or coated pans may have specific directions for greasing.

Room Temperature Ingredients

Prior to mixing, bringing all ingredients to room temperature (68°F to 70°F) is an essential step in preparing a well-mixed cake.

Butter

Butter should be brought to between 60°F and 70°F, or as stated in the recipe, but it shouldn't be too soft (or melted). Butter that is too cold won't beat evenly. It won't incorporate air or increase in volume. Butter that is too soft is unable to adequately trap air, and it may cause the cake batter to collapse in the oven.

Eggs

Cold eggs do not whip as well as room temperature or warm eggs. Cold eggs decrease cake volume and may cause a chocolate batter to seize (not blend smoothly). When eggs and liquids are cold, the batter can curdle (separate into liquid and fat), and the texture may become too dense.

Fat

If any of the ingredients are too warm, the fat will melt and not whip effectively enough to incorporate air.

Sifting

Thoroughly sifting all dry ingredients together helps produce an evenly-baked cake.

Lumps

Cake flour and cocoa powder are finely ground products. They tend to form small lumps that don't break apart during blending or beating, especially when they are not sifted with the other dry ingredients.

Tunnels

The result of unevenly sifted dry ingredients can be the creation of large holes and tunnels in the middle of the baked cake.

Raw Flour Pockets

Using a sifter or a wire whisk helps ensure that all raw flour is evenly distributed throughout the batter (and that no pockets of batter are surrounded dry flour).

Mixing

Mixing is a general instructional term that describes stirring, beating, blending, binding, creaming, whipping, and folding—any action that combines two or more ingredients evenly to become one product. Each mixing method adds a different texture and character to a baked good. Even the paddle, hand-whisk, or wire-whisk attachment can make a difference in the final outcome. (The type of spoon can also affect the finished product.)

- *Stirring:* All ingredients are mixed together with a utensil, usually a spoon, in a circular motion.
- *Beating:* Ingredients are moved vigorously in a back-and-forth, up-and-down, and around-and-around motion until the components are smooth.
- *Blending:* Everything is thoroughly mixed until the ingredients become one product.
- *Creaming:* Fat and sugar are beat together until they are light, airy, and pale-colored.
- *Whipping:* Air is incorporated into the ingredients (often whole eggs, egg whites, or heavy cream) by mechanical means, such as a stand mixer, a hand mixer, or a wire whisk.
- *Folding:* One ingredient is gently folded into another, by hand, with a large spoon or spatula. This keeps the batter light and aerated. (Whipped creams and eggs are often folded into other ingredients to maintain their airy quality.)

Sponge

A **sponge** is a light and airy foam cake that contains three basic ingredients: eggs, sugar, and flour. A **biscuit** is the French term for sponge cakes. These cakes are leavened by air beaten into the eggs. They contain fat from egg yolks (and sometimes, oil). A sponge cake is prepared by beating room temperature egg yolks and sugar until they are thick and lemon colored. [TIP: "Thick and lemon colored" is usually signaled by the ability of the mixture to ribbon off of the beater and back into the bowl. The flour is added, and then folded, into the stiffly-beaten, egg-white mixture (sometimes with cream of tartar already incorporated into the whites). The following is a list of tips when making sponge cakes.

The Ribbon Stage

All sponge-cake recipes test the doneness of egg-and-sugar whipping using the ribbon stage. The **ribbon stage** is a test to see if the batter forms a thick stream that folds back on itself as

it's lifted from the bowl. [NOTE: Watch the 18-minute recipe and video, "American Sponge Cake," on the Joyofbaking.com website at http://www.joyofbaking.com/AmericanSpongeCake.html. This shows the ribbons of an egg-white mixture, and the method of folding flour into the egg whites.]

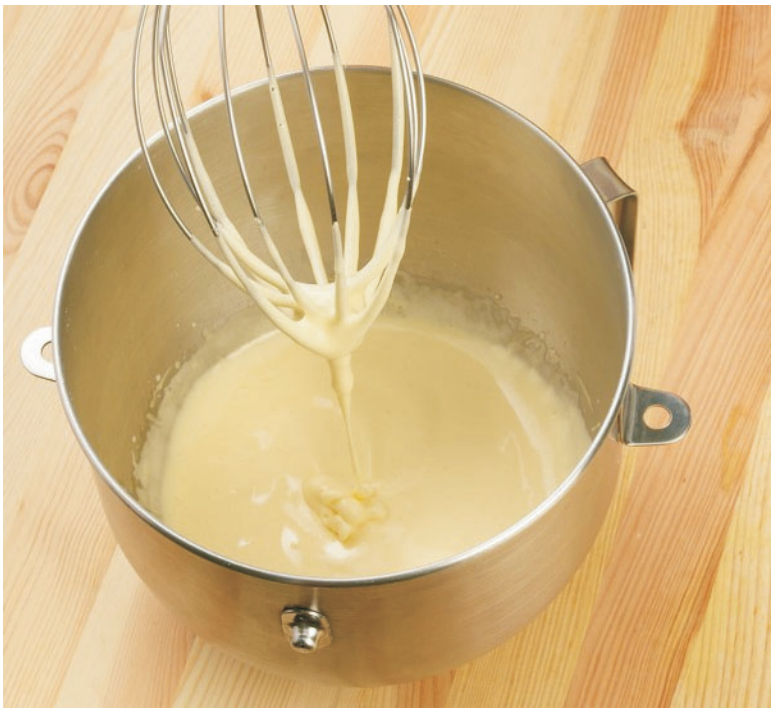


FIGURE 10. When mixing a sponge cake, common benchmarks need to be achieved. Two of those are beating the egg mixture until it is thick, lemon in color, and ribboning off the beater. The ribbon stage is a test to see if the batter forms a thick stream that folds back on itself as it's lifted from the bowl.

Baking Techniques

Most sponge cakes are baked in sheet pans and rolled up (jellyroll fashion), or they are baked in round deep-sided layer pans. Fillings or toppings include fresh fruits, fruit purées (and jam), nuts, ice cream, sweetened whipped cream, buttercream icing, a chocolate glaze or ganache, or other cream fillings in rich flavors. Sponge cake can also be baked in a sheet pan and cut into small sponge cake shells.

Flavorings

Common flavorings include extracts, citrus zest, cocoa powder, or liqueurs.

Sponge Cake Types

Sponge cakes have many qualities essential for a variety of cakes.

Ladyfingers

Ladyfingers are a low-density, dry, egg-based sponge shaped much like a person's finger. They are leavened with a chemical leavening agent (along with the separately beaten egg yolks and egg whites). The batter is piped into long fingers before baking. [NOTE: Watch "How to make ladyfingers" on the Eddy Van Damme website at http://www.chefeddy.com/2009/11/how-to-make-ladyfingers/.]

Flourless

Flourless chocolate sponge cake is made with chocolate, cocoa, and separately-beaten egg yolks and egg whites. [NOTE: Watch 20-minute video of a Chocolate Sponge Cake recipe on the Joy of Baking website at http://joyofbaking.com/ChocolateSpongeCake.html.]

Torte

A **torte** is a rich cake made from layers of cake and cream. There are several sponge variations and recipes for tortes.

Roulade

A **roulade** is any foam cake baked in a jellyroll pan, removed from the pan, and rolled in a towel while still warm. This allows the cake to "shape or mold" around the filling without breaking. Roulade cakes may be filled with whipped cream, ganache, lemon curd, buttercream icing, jelly, or jam. (Pronounced "guh-NAWSH," **ganache** is a whipped mixture of chocolate and heavy cream.)

Petit Fours

Petit fours are small, decorative, and layered bite-size sponge cakes, often covered with fondant or marzipan icing. The protein structure from the large proportion of eggs in the batter holds the cake together. This allows for the following:

- Flavorings, liqueurs, or soaking syrups can be brushed on the layers without crumbling the cake. Angel food and most foam cakes have a delicate flavor and aroma that compliment a variety of flavored syrups, fillings, and toppings.
- Round sponge-cake layers can be cut crosswise, covered with a filling, stacked, topped, or iced.
- Other cakes can be decorated with the petit fours. Decorations can be created when cutting the layers, and then molded onto the outside of other cakes.
- Mousse and ganache mixtures can be held by petit fours without becoming soggy.

Boston Cream Pie

A **Boston cream pie** is a two-layered (minimum) sponge cake filled with a vanilla pastry cream and topped with a chocolate glaze (or, sometimes, a dusting of powdered sugar). It is said these cakes were originally baked in a pie tin, hence their name. [NOTE: There are numerous variations of the original Boston cream pie. Some fold in beaten egg whites, have multiple layers, or add ganache. Go to the Yankee magazine article at https://newengland.com/yankee-magazine/food/desserts/pies-pastries/boston-cream-pie-2/.]

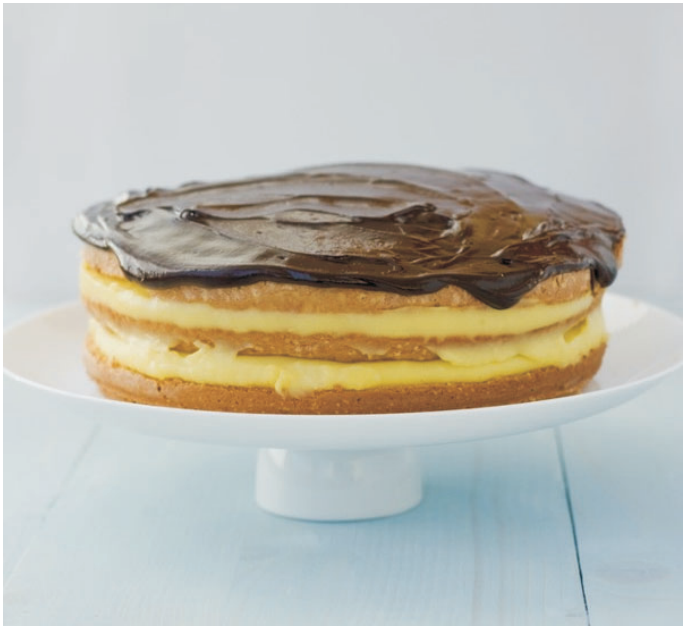
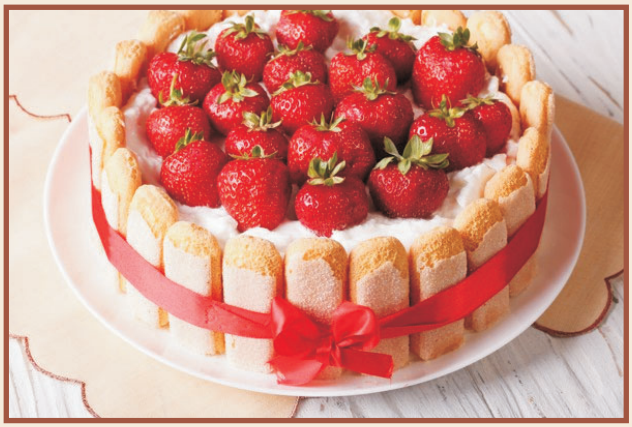


FIGURE 11. There are numerous variations of the original Boston cream pie. For instance, some fold in beaten egg whites and others do not.

DIGGING DEEPER...

UNCOVERING ADDITIONAL FACTS: Sponge Cake is "Biscuit" in French

French sponge cakes are called biscuits. These biscuits are nothing like the American quick-bread baking powder biscuits. The French biscuit is a foam cake or made without butter or oil. Like our American sponge, it uses whipped eggs for leavening. For more information and a wide variety of examples, see the CraftyBaking website's "Biscuit (French)" article (with recipes) at https://www.craftybaking.com/learn/baked-goods/cakes/types/biscuit-french. Prime membership is required to see all recipes, but the pictures, and many of the biscuit recipes, are free. Check out the "Hearts and Strawberry Roses Charlotte" cake. What a great Valentine's Day dessert!



The strawberry charlotte dessert pictured here is created from ladyfingers, chocolate cream filling, and a fresh strawberry topping.

The Sponge Method

The **sponge method** (foam method or egg-foaming method) is a foam-cake, egg-beating technique for creating leavening from whole eggs. In most cases, the beaten eggs are the only leavening in the cake. The trapped air from the whipped eggs gets hot, expands, and forms steam (leavening) while the cake bakes. Foam cakes contain a high proportion of eggs (or egg whites) in relation to other ingredients. This makes its cell structure larger and coarser than creamed and blended cakes. The sponge method requires ingredients to be at room temperature. Whole eggs and sugar are often warmed (100°F to 105°F) in a hot water bath (bain-marie) and whisked continuously. This provides a larger volume of air that is added to the mixture, thus producing the spongy texture. Pans for sponge cakes are often ungreased. This allows the delicate cakes to cling to the pans' sides while baking. Often, sponge cakes do not shrink from the sides of the pan. There are several steps you will follow in the sponge method.

Step One

Perform mise en place. Bring ingredients to room temperature (68°F to 70°F) prior to mixing. Weigh all ingredients separately. Cold eggs do not whip as well, or provide as much volume, as room-temperature or warmed eggs. Often, you can separate cold eggs (easier than warm) and then cover them until they are at room temperature. If the recipe uses whole eggs (specifically, some génoise cakes), place the egg (still in the shell) in warm water for five minutes before whipping. Preheat the oven. Angel, chiffon, and most sponge cakes are baked in

ungreased pans. The cakes crawl up the sides of ungreased pans for support during baking. [NOTE: This is the typical cake pan preparation for foam cakes.] An ungreased parchment liner is a quick cake-pan preparation used for some génoise cakes. [NOTE: A few foam cakes use other cake-pan preparations. Those methods will be covered later.]

Step Two

Whisk together the dry ingredients. (This includes half of the sugar. The sugar combines with the flour to prevent flour-starch particles from clumping together.)

Step Three

Beat the warmed eggs and/or egg yolks, the other half of the sugar, cream of tartar (if called for), and the flavoring on medium speed to twice their original volume. Test to ensure that the batter mixture forms the ribbon stage before moving onto the next step.

Step Four

Set the mixer speed to "low" and slowly add any other liquids and flavorings (only if called for in the recipe).

Step Five

Switch to the paddle attachment (or a spatula) and gently fold in the dry ingredients. This will be done until the batter is smooth without dry pockets (carefully, as to not deflate the batter). For best results, slowly sift the dry ingredients into the batter, folding between additions. To **fold** is to combine two mixtures, one light (airy) and one heavy (dense), without deflating the lighter mixture. Folding can be completed with a wooden spoon, rubber spatula, a paddle attachment, or with a wire whisk.

- The folding action is a downward motion and a careful turning over of the mixture (this prevents the air from escaping). This action is completed while turning the bowl and scraping the mixture from the bottom with the spoon or spatula.
- You should complete the folding quickly and completely (no streaks of batter, whipped eggs, or egg whites should remain).

Step Six

Fold in any melted butter, clarified butter, or oil to the batter (only if designated by the recipe).

Step Seven

Portion the batter into prepared pans and bake. Foam cakes are baked in a preheated oven immediately after mixing (to prevent the loss of air bubbles). The rush of the hot air allows the cake to fully rise (from the development of steam and the coagulation of the egg-foam bubbles). In contrast, an unheated oven prevents egg-foam coagulation at peak volume, and it can deflate.

Chiffon

Chiffon is a foam cake that is moist, tender, light, airy, springy, and made with fat. Chiffon cake fats may include egg yolks, butter, or oil. Because they contain fat, they exhibit some characteristics of butter cakes, especially their moist, tender quality. They are leavened with beaten egg whites, egg yolks, and baking powder. Chiffon cakes are often citrus flavored, but they may also be chocolate or contain chopped fruits or nuts.

Pans

These cakes are often baked in tube pans or angel food cake pans. Two-piece tube pans make removing the cake from the pan easier.

Cooling

After baking, chiffons should be immediately turned upside down to prevent the foam structure of the cake from shrinking and to ensure that air circulates around the entire pan to cool. After they have completely cooled in the pan, they can be removed. A knife or thin spatula helps loosen the cake from the tube pan. [NOTE: Bakepedia has an orange chiffon cake recipe by Dede Wilson at https://www.bakepedia.com/orange-chiffon-cake/.]

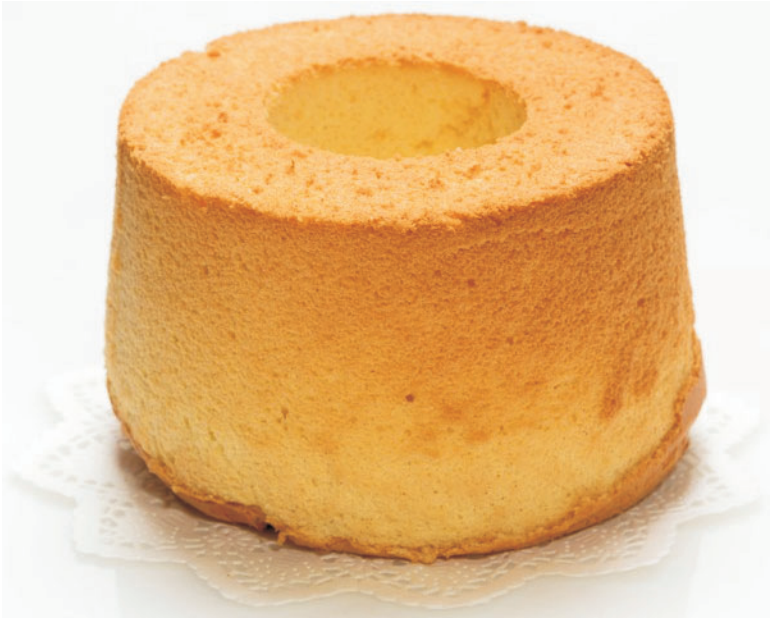


FIGURE 12. Notice the yellow color of the chiffon cake. Chiffon cakes are made with beaten egg whites and egg yolks. This chiffon cake was baked in a tube pan.

The Chiffon Method

The **chiffon method** is a foam-cake preparation for folding beaten egg whites into a batter of egg yolks, flour, and fat. This method incorporates all whipped ingredients (egg whites, meringue, heavy cream) into the batter in thirds using the folding motion. A key to this mixing method is the ensuring that each third is thoroughly incorporated before adding the next third. Bakers are also careful not to deflate the mixture during folding. The steps you use the chiffon method are as follows:

- *Step One:* Prepare mise en place, following all steps. Be sure to bring all ingredients to room temperature (68°F to 70°F) prior to mixing. Weigh all ingredients separately. Preheat the oven. Cake pans are prepared by the grease and flour method, the grease-parchment-grease method, or the grease and sugar method. [NOTE: Follow directions on the recipe for cake pan preparation.]

- *Step Two:* Sift dry ingredients together in a bowl—set aside.
- *Step Three:* Combine liquid ingredients, fat (including egg yolks), and flavoring into a bowl and set aside.
- *Step Four:* In a mixer, whip room-temperature egg whites (with cream of tartar, if called for in a recipe) until they have medium peaks.
- *Step Five:* Alternate folding thirds of the dry and liquid ingredients into the egg whites (ending with dry ingredients). Take care not to overmix. [NOTE: Some cakes will have whipped cream to be added during this portion. It will be folded in between the liquid and dry ingredients above.]
- *Step Six:* Portion the batter into prepared pans and bake.

Génoise

A **génoise** is a foam cake characterized by a light, airy, sponge-like texture that is made with melted (or clarified) butter, whole eggs beaten to the ribbon stage, and no added leaveners. Eggs and butter make this cake moist with a tender mouthfeel. It is also less sweet than a typical sponge cake. Génoise cakes are also known as European cakes, as they are named for the cake's place of origin, Genoa, Italy. Génoise cake recipes vary.

Sugar and Egg Mixture

Some bakers heat the sugar and whole egg mixture until warm over a pot of simmering water. Because the pan or bowl cannot touch the simmering water (the protein in the egg would coagulate), the easiest method is the use of a double boiler. A larger bowl could also be placed atop a smaller pan of simmering water (like a bain-marie). Then, the warmed sugar and egg mixture is whipped until the mixture forms a ribbon. [NOTE: If the egg mixture starts getting lumpy, the eggs are cooked, and the baker has to start over.]

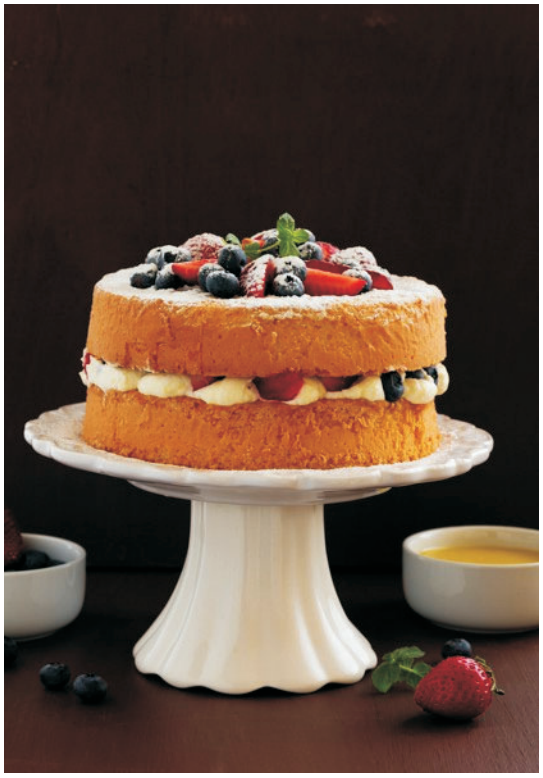


FIGURE 13. A génoise is a foam cake characterized by a light, airy, sponge-like texture that is made with melted (or clarified) butter, whole eggs beaten to the ribbon stage, and no added leaveners. Eggs and butter make this cake moist with a tender mouthfeel.

Butter

Different bakers swear by either regular-melted or clarified butter. [NOTE: Danilo Alfaro has a step-by-step process in an article, "How to Make Clarified Butter," on The Spruce Eats website at https://www.thespruce.com/how-to-make-clarified-butter-995451.]

Demos

Since eggs are the only leavening in this cake, you should watch a demonstration video before attempting the recipe. Videos demonstrating how whole eggs are

beaten until lemon in color and tripled in size (the ribbon stage), how to measure sifted flour, the folding technique (to prevent the loss of the egg volume), and génoise cake techniques are also available on multiple sites. [NOTE: The CraftyBaking website has an egg-beating and génoise demo at https://www.craftybaking.com/howto/eggs-beating-techniques-whole-eggs-and-yolks.]

Angel Food Cake

An **angel** (angel food cake) is a foam cake characterized by a feather-light, delicate, airy texture that is made with egg whites, flour, sugar, and no fat. Angel cakes contain no egg yolks, no chemical leavening agents, and no butter or oil. They contain more sugar than any other foam cake, but they are cholesterol free (because they contain no fat and no egg yolks). It is basically a meringue with flour added. Angel food cakes were invented in the United States and dubbed "the food of the angels."

Egg Whites

These cakes are made with 10 to 12 whipped egg whites, cream of tartar (for egg white stabilization), sugar, flour, salt, and extracts. [TIP: Extra care must be taken to ensure that no egg yolk or any speck of fat comes in contact with the egg whites, the bowl, or the whisk. Even one speck of fat prevents the egg whites from reaching peak volume.]

Pans

They are baked in ungreased tube pans (angel food pans). The lack of grease helps the egg white batter cling and climb up the sides of the tube pan. The pan should be cooled completely, upside down, to prevent the cake structure from collapsing.

Angel Cake Desserts

Angel cakes are a base for numerous desserts.

Stuffed Angel Food Cake

To stuff an angel cake, you cut off the top third, make a tunnel, and add a gelatin, curd, chocolate ganache, fresh fruit, whipped cream, pudding, or other filling.

Layered Angel Food Cake

The cake is cut into two to three layers. It is then filled or frosted with any of the toppings listed for stuffed angel cakes. [NOTE: The New York Times author, Melissa Clark, posted an amazing lemon-curd, layered, angel-food recipe from High Street restaurant at https://cooking.nytimes.com/recipes/1018018-lemon-angel-food-cake-with-preserved-lemon-curd.]

Trifle

A **trifle** is a British dessert that is layered in a straight-sided dish, and it can include any combination of foam cake (usually angel food or sponge), cream, custard, fruit, jam, and sweetened whipped cream.

Roulade

Angel cakes create light roulades. Baked in a sheet or jellyroll pan and rolled in a towel while warm, an angel cake can then be filled, iced, sugared, and sliced crosswise to reveal a spiral shape.

The Angel Method

The **angel method** is a foam-cake preparation technique that focuses on the beating of air into egg whites for maximum leavening. In most cases, the beaten egg whites are the only leavening in the cake. The angel cake method directs ingredients to be at room temperature prior to mixing. This provides a larger volume of air that is added to the mixture, thus producing the spongy open texture. Pans for angel cakes are ungreased. An ungreased pan ensures that this delicate cake batter will cling to, and climb up, the sides of the pan while baking. Angel cakes do not shrink from the sides of the pan like butter cakes. The steps for you to produce a perfect angel cake are listed below.

- *Step One:* Prepare mise en place for ingredients, oven, pans, and cooling station. Ingredients should be room temperature, but some recipes will call for the egg whites to be warmed in a bain-marie.
- *Step Two:* Combine, sift (four times), and then set aside the cake flour and one-fourth of the superfine sugar.
- *Step Three:* Use the wire whisk attachment and beat the egg whites, salt, and cream of tartar, gradually add the remaining superfine sugar. Bring the egg white mixture to stiff peaks. (Basically, a French meringue is made.) [NOTE: If using a copper bowl, follow the directions on the recipe]
- *Step Four:* In thirds, gently fold the dry ingredients into the egg whites.
- *Step Five:* Portion the batter into prepared pans and bake.
- *Step Six:* Invert the pan to cool completely.

Meringue

Meringue is a flourless foam cake prepared from a mixture of stiffly-beaten, room-temperature egg whites and sugar (or sugar syrup). Meringue mixtures are often stabilized with cream of tartar and contain no fat. There are three basic types of meringue: French, Swiss, and Italian.

Meringue Types

These common meringues have a few differences.

French

French meringue is the most commonly prepared and the least stable type of meringue (until baked). All preparations are completed without heat, until the egg-white mixture reaches stiff peaks.

Swiss

With Swiss meringue, the egg whites are gently beaten with sugar over a double boiler. When the mixture reaches 120°F to 130°F, the sugar is dissolved. Then, the mixture is removed from the heat and beaten to stiff peaks. It's smoother and silkier in appearance than French meringue.

Italian

Italian meringue is prepared by slowly drizzling 240°F sugar syrup into room temperature whites that have been whipped to a firm peak. This is then re-whipped until the mixture is satiny, stiff, and cooled. Italian meringue is a base for many buttercream frostings.

Meringue Shell

A **meringue shell** is a light, airy, nest formed from any meringue product, dried in the oven to a chewy and soft texture, and filled with sweetened creams, curds, custards, ice creams, fruits, or ganaches. To make meringue shells:

- Beat the mixture to stiff peaks with more sugar than for a common meringue.
- Spread the meringue is on parchment paper with a spoon, or you can pipe it with a pastry bag into circles, heart shapes, or other designs. Shells can be thin for stacking, as for a meringue cake, or shaped with a depression (nest) in the middle to hold a filling.
- Bake meringue shells in the oven, slowly. (Usually, 225°F to 300°F is recommended. One recipe variation calls for you to preheat an oven, turn it off, place the shells, and leave the oven light on for overnight drying). [TIP: To prevent gummy, sticky, and hard meringue shells, bakers usually select a day with low humidity to make the shells.]

Meringue Cake

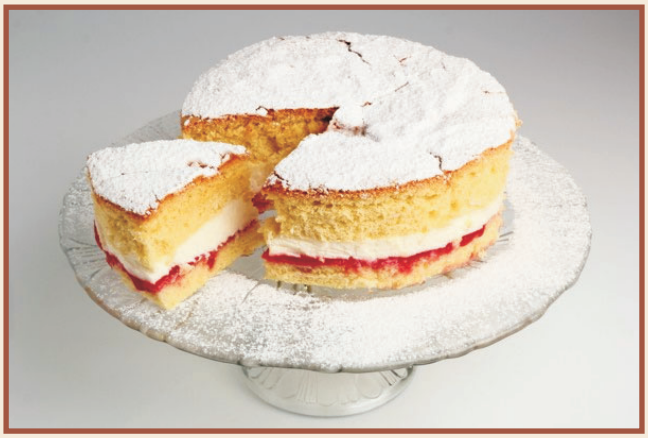
A **meringue cake** is a series of hard meringue disks layered with fillings. [NOTE: The MyRecipes.com website posted a Southern Living recipe, "Fresh Strawberry Meringue Cake," at http://www.myrecipes.com/recipe/fresh-strawberry-meringue-cake. Recipes for meringue cakes vary greatly. They can include layers of butter cake, meringue disks, sweetened cream, custard, or berries.]

FIGURE 14. This baker is folding beaten egg whites into a chocolate-hazelnut meringue-cake batter. Folding requires the baker to fully incorporate the egg whites, so that no streaks of meringue or batter remain, while taking care not to deflate the batter.

DIGGING DEEPER...

UNCOVERING ADDITIONAL FACTS: Victoria Sponge

The Victoria sponge (or Victoria sandwich) is named for Queen Victoria of Great Britain. It is two layers of sponge cake filled with fruit jam and whipped cream. The top is dusted with caster sugar (not powdered sugar). This was said to be her favorite treat with afternoon tea.



The Victoria sponge has many variations. The one pictured here is filled with a custard cream and raspberry jam.

Dacquoise

A **dacquoise** (pronounced "dah-kwahz") is a French dessert cake that is assembled with layers of almond and hazelnut meringue discs and then topped with whipped cream or buttercream icing. [NOTE: The Craftsy article and recipe, "Dessert 101: What is Dacquoise & How is it Used?," can be seen at https://www.craftsy.com/blog/2015/07/what-is-dacquoise/.]

Pavlova

A **pavlova** is a filled, meringue-shell dessert with a crisp crust and a soft and light interior (typically filled with sweetened cream and fresh fruits). It is said to have been created for the Russian ballerina Anna Pavlova when she was touring Australia and New Zealand. [NOTE: The Truffles and Trends website has a mixed-berry pavlova that can be seen at https://www.trufflesandtrends.com/home/2016/4/27/mixed-berry-pavlova-layer-cake.]

Testing Doneness

Bakers all have their own systems for knowing when a cake is done. Most home cooks and professional chefs test cakes for doneness by using one of a few time-honored methods. With practice, a baker develops a sense of the additional time the cake will need.

Time, Temperature, and Aroma Test

You can surmise doneness after the cake has been in the oven for the requisite amount of time, has baked at the suggested temperature, and "smells like cake."

Toothpick Test

Carefully insert a toothpick, a thin skewer, or a cake tester into the center of the cake. If it comes out clean, the cake is done. If not, it needs more time. Wash and dry the cake tester after each use (or use a new toothpick). [NOTE: Most sponge cakes do not use the toothpick method of testing for doneness. Typically, the insertion of a toothpick is not necessary as the other test methods are more accurate for foam cakes.]

Color Test

The cake is lightly browned (golden).

Touch Test

When you touch the cake's center, it should spring back. If it has an indentation, it needs more time.

Cooling

Most cakes should be cooled before icing or serving. With foam cakes, most are ungreased and have limited leavening. Certain steps need taken to assure the consistency stays in tact after removing them from the oven.

Inverted

Angel, and many sponge cakes, are baked in tube pans and cooled upside down—on their pan legs or on a bowl (for air circulation). Foam cakes are cooled inversely to avoid collapse as they cool (especially when no chemical leavening is used). Most foam cakes are not removed from the pan until completely cooled—just prior to being iced (although some exceptions do exist). To remove a foam cake from a pan, a knife or thin metal icing spatula is ran around the outside edges (to loosen them). A two-piece tube pan makes it easier to remove the cake from the pan. A knife around the tube center (and then around the bottom of the tube pan after it is disconnected) separates it from the cake.

Rolled

Roulades (jellyrolls, Swiss rolls, etc.) should briefly cool on a cooling rack, be removed from the pan, and then immediately rolled in a clean, powdered-sugar-dusted kitchen towel. They are then returned to the cooling rack.

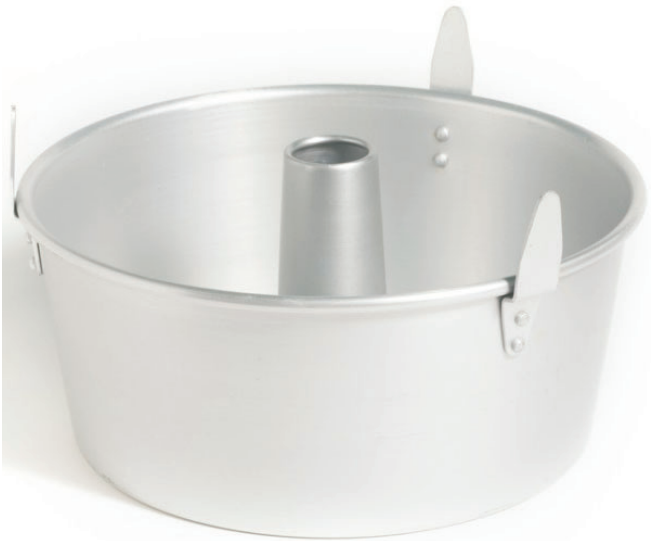


FIGURE 15. How are the footings on this tube pan used? What makes the feet important to an angel food cake? Which cakes are cooled while inverted?

UNDER INVESTIGATION...

LAB CONNECTION: Homemade Twinkies®!

How do you make Twinkies®? First, you must form Twinkie® molds from aluminum foil. (Try shaping them around a round spice jar.) Then, bake the sponge cake batter in the foil molds and let them completely cool. While the cakes are cooling, make the filling. The filling is a mixture of butter, solid shortening, powdered sugar, marshmallow cream, and thawed whipped topping. Remove the foil. Finally, the filling mixture is piped into a slit made on the backside of the Twinkie®. The "Homemade Twinkie" recipe and video are found on the AllRecipes website at http://allrecipes.com/video/3414/homemade-twinkies/?internalSource=related_carousel&referringId=3414&referringContentType=video.

The cake recipe on the video is made from a yellow cake mix (mixed with water and egg) and a dry instant pudding mix. That would make it a variation of a butter cake (a pudding cake). EXPERIMENT: Make the recipe from a traditional sponge cake recipe also (from scratch). Compare taste, color, flavor, texture, density, and aroma. Place both batters in the foil molds and use the same recipe for the filling. Which was better? Which tasted most like a Twinkie®?

Removed before Cooling

Some sponge and génoise cakes (especially those baked in layer pans) briefly sit on a cooling rack before being removed from the pan, placed on parchment, and then put back on a cooling rack. Once cooled to the desired temperature, the parchment liner can be removed. Some recipes call for the immediate removal of the parchment paper from the sponge cake, while others cool with the parchment paper in place. After completely cooled, the baker can cut, fill, and ice as directed.

Summary:

A foam cake is a light, airy, spongy cake with little or no fat. They have a high proportion of eggs to flour and are leavened primarily by air beaten into eggs. Foam cake categories are sponge, chiffon, meringue, and génoise. Primarily, foam cakes are leavened by whipped eggs and steam. The three most important ingredients in a foam cake, in order of importance, are eggs, sugar, and flour. Most foam cakes are drier than butter cakes because they contain little or no butter or oil.

A unique piece of equipment used with foam cakes is the tube pan. It is frequently used with angel and chiffon cakes. There are four basic foam cake preparation methods, including sponge, chiffon, meringue, and angel. Common foam cake preparation techniques include folding, whipping, and the ribbon stage.

Checking Your Knowledge:

1. Describe foam cakes.
2. What makes eggs the most important ingredient in a foam cake?
3. How do you know when a mixture has reached the ribbon stage?
4. Differentiate between sponge, chiffon, and angel cakes. What makes each unique?
5. Describe five ways to prepare cake pans for foam cakes.

Expanding Your Knowledge:

What is the history of the sponge cake? Ancient Middle Eastern cultures made cakes with layers of honey and nuts. The Romans adopted this concept during the conquests of Europe. Opera cake, a 20th century recipe, is similar to tiramisu, and it has roots in those ancient layered cakes. During the renaissance, Italian cooks were hired in France and England. These Italian cooks introduced the first sponge cakes to the French. When introduced to England, the French biscuits were unleavened and crispy. To this day, Brits call cookies "biscuits," and the whipped, lighter sponge was dubbed a "cake." In Naples, Italy, Lisbon, Portugal, and Spain, sponges (biscuits) were baked in small long pans—the first ladyfingers. In the 18th century, sponge cakes were made in two tin hoops—the first layer-cake pans.

Sponge cake was the first non-yeast cake. In 1615, the first sponge-cake recipe to be mentioned in a work of literature appeared in the work of an English author, Gervase Markham. Jane Austen also wrote about sponge cakes in 1808. The 1820 poem "The Cap and Bells" by John Keats talks about ladyfingers. He says, *"Fetch me that Ottoman, and prithee keep your voice low, said the Emperor; and steep some lady's fingers nice in Candy wine."* The poem talks about the Emperor dipping the ladyfingers in a sweet wine. See the entire poem and background information on David Radcliffe's "Spenserian" website at http://spenserians.cath.vt.edu/TextRecord.php?textsid=36307.

Twinkies® were developed on June 25, 1930, are sponge cakes, and were originally filled with a banana-pudding cream. Read an interesting article by William Grimes about Twinkies® on The New York Times website at https://www.nytimes.com/2012/01/15/fashion/twinkies-a-history.html.

Foam cakes began in ancient history and continue today. Sponge cakes have fed Roman conquerors during the European campaigns, Queen Victoria during afternoon tea, and snack-cake fans of today. For more information on sponge cakes, see the Web links below.

Web Links:

Biscuits and Sponge
http://www.foodtimeline.org/foodcakes.html#sponge

Sponge Cake History
https://whatscookingamerica.net/History/Cakes/SpongeCake.htm

Victoria Sponge Cake and History
http://teainengland.com/2012/12/the-victoria-sponge-its-history-and-a-recipe/