

# **BAKE IT RICH!**

Butter is an important ingredient for great tasting bakery products. Not only does it help to impart the characteristic flavor to fresh baked goods, but it helps in maintaining crumb softness, aids in the development of flaky crusts and pastries and provides significant added value.

## **FLAVOR**

Butter is used for many reasons in baked goods, but one of the primary reasons is for flavor. Bakers turn to butter to add a rich, unique flavor to pastries, cakes, cookies, pies and breads. Although there are over 120 different compounds that contribute to butter's unique flavor, the five primary factors responsible for butter's flavor include: fatty acids, lactones, methyl ketones, diacetyl and dimethyl sulfide.

Methyl ketones and lactones are the primary components responsible for the cooked flavor associated with baked goods made with butter. Both methyl ketones and lactones are present in fresh butter at levels which are below their Flavor Threshold Value (FTV) or below the concentration at which their taste is perceptible. Upon heating, however, the total concentration of both lactones and methyl ketones exceeds their FTV. The two compounds also react in a synergistic manner, providing the rich flavor associated with baked goods made with real butter. The methyl ketones and lactones also interact with the flavors developed through the Maillard reactions (browning reactions between sugars and proteins) which occur during baking. The combination of all flavor compounds contributes to the overall appeal and flavor of the finished baked good.

## **FLAVOR CARRIER**

Butter works very well as a flavor carrier for spices, vanilla and other fat-soluble ingredients, thus providing added flavor to finished goods and providing food manufacturers with a wide variety of options for new product development.

## **CRUMB SOFTNESS**

Crumb softness and changes therein are related to a number of factors, including starch retrogradation, or recrystallization. Starch is a mixture of amylopectin and amylose molecules. During the baking process, some amylose leaks out of the starch molecule into the space between the granules. Here it dissolves in water, and upon cooling, forms a gel which contributes to the structure and firmness of the bread. With time, the amylose recrystallizes to its initial form and the bread becomes hard and brittle.

Butter helps to improve crumb softness by retarding the development of gluten, coating the strands, making them shorter and hence keeping the product tender. As a result, butter contributes to the tenderness of cakes, breads and biscuits.

## **FLAKINESS**

Butter is the ideal ingredient for the development of a flaky crust or pastry dough. When butter is trapped between layers of dough, it melts during baking, making the batter slightly more fluid or flexible. Carbon dioxide, which is released during baking, travels more easily to the air pockets left by the butter. The air pockets trap the carbon dioxide and the resulting dough is flaky.

## **ADDED VALUE**

Butter also functions as an emulsifier, resulting in better distribution of the ingredients throughout the dough, and helping to prevent “fat bloom” spoilage in biscuits.

Butter is considered by consumers to be a value-added, high-quality ingredient. As a result, baked goods made with butter are also considered high-quality, delicious products. Manufacturers can take advantage of the numerous functional attributes of butter, and reap the marketing benefits of using real dairy butter.

## **BUTTER VALUE**

Consumer interest in healthy baked goods can still be met when using butter. In fact, there is still strong demand for upscale, rich baked goods. In the new cakes, cookies, pastries and pies which are being developed to meet this demand, butter provides unmatched texture and flavor. In addition, butter’s premium image is an important factor in these products, providing manufacturers with more selling points.

## **STORAGE RECOMMENDATIONS**

Butter should always be stored in original cartons, away from highly aromatic food and in storage rooms with controlled humidity (80-85 percent). Bulk butter can be refrigerated (32-38°F; 0-3°C) for up to nine months or frozen (-10 to -20°F; -23 to -29°C) for up to eighteen months.

Only butter which is intended for immediate use should be thawed.

## **THAWING BUTTER**

When thawing frozen bulk butter, chimney stack the butter boxes or distribute around a room with controlled relative humidity (not to exceed 20 percent) and with good ventilation (preferably air conditioning). Temperature should be kept around room temperature (60-65°F; 16-18°C) not exceeding 70°F (21°C). During the thawing process, the product should be moved, to ensure even, slow thawing. A 68 pound block will thaw in approximately four to five days under these conditions.

## **TIPS FOR USAGE**

For pastry doughs, butter should be kept as hard and cold as possible. In cake batter, butter should be thawed prior to use and creamed well with the sugars to ensure a complete, even distribution in the final batter. In most other bakery applications, butter can be added either in its solid or melted form.

# BAKE IT RICH !

Characteristic	Properties	Benefits	Applications
<b>Flavor</b> Lactones 1-40 ppm Ketones 1-35 ppm	Provides unique, characteristic flavor and aroma	Concentration of flavor compounds increases with higher temperatures and is responsible for cooked butter flavor associated with baked goods	Cookies, crackers, breads, pastries, rolls, muffins, cakes
	Interacts with Maillard reaction compounds	Combines with flavor compounds of Maillard reactions to enhance overall appeal and quality of baked goods	
	Unmatchable flavor	Unique butter flavor enhances all baked goods providing rich, mellow background or primary flavor	

<b>Flavor Carrier</b> Total lipids 81.11%	Flavor carrier	Can function as a flavor carrier for spices, sweet flavors and herbs, contributing added appeal and value	Muffins, cookies, cakes, pastries
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<b>Tenderizing Effect</b> Lecithin 0.24% Total lipids 81.11%	Crumb softener, retards gluten development	Coats gluten strands keeping them from forming a gluten matrix	Cookies, cakes, breads, pie crusts
	Entraps moisture	Moisture slows starch retrogradation and helps extend shelf life	
	Contributes to dough flakiness	Butter not thoroughly mixed into dough contributes to dough flakiness	Pie crusts, pastries

<b>Mouthfeel</b> Melting Point 82.4-96.8°F 28-36°C	Reduces waxy mouthfeel of other fats	Helps improve texture of other fats reducing the waxy mouthfeel associated with some vegetable shortenings	Cakes, cookies, biscuits, crusts, crackers
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<b>Emulsification</b> Lecithin 0.24%	Better distribution of ingredients	Assists in better distribution of the ingredients for a more homogeneous batter	Cakes, cookies, pastries, breads, rolls, muffins
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<b>Prevents "Fat Bloom"</b> Fatty acids/glycerides 81.11%	Helps prevent "fat bloom" spoilage	High melting glyceride fractions prevent "fat bloom" spoilage	Biscuits
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<b>Added Value</b>	Added consumer appeal	Consumers value and recognize the high-quality and taste of baked goods with butter	Pastries, cookies, cakes, pies, breads
	All natural	100 percent natural, multifunctional ingredient	All baked goods

# LIVEN UP CONDIMENTS/SAUCES

Butter is an ingredient with many functional advantages when used in sauces. Not only does butter provide a unique, rich flavor, but it contributes to the smooth, creamy mouthfeel of sauces as well. Butter works well with sweet and savory sauces, and is an important ingredient in dessert toppings, such as butterscotch.

## BUTTER'S CHARACTERISTIC FLAVOR

Undoubtedly, butter is used most often in sauce applications for its unique, delicious flavor. Over 120 compounds contribute to butter's flavor, but two classes of flavor compounds are responsible for the most characteristic flavor notes: methyl ketones and lactones. Both compounds are present in butter at concentrations below detection levels, or below their Flavor Threshold Value (FTV). When butter is heated, the total concentration of both lactones and methyl ketones rises above their respective FTVs and the two compounds react synergistically resulting in a full, rich butter flavor.

Butter flavor compounds not only react with one another, but with other flavor compounds as well, providing a full-bodied flavor. Butter can be used to provide the primary, characteristic flavor of a sauce, as in Bechamel-type sauces, or in dessert toppings, such as butterscotch. It can also be blended with other ingredients to add rich dairy background flavor notes, as in pasta sauces and gravies.

Butter can be heated to different temperatures to produce characteristic flavor notes associated with different sauces. For example, lightly melted butter is typically used in creamy, white sauces, such as Hollandaise, Bordelaise or Bernaise, to provide rich, dairy notes. Slightly overheated butter provides roasted, cooked notes which complement brown sauces and gravies. Overheated, unburned butter will contribute flavor notes which complement flavors in barbecue and smoke flavored sauces.

## MOUTHFEEL

Two of the most important characteristics of a sauce are its mouthfeel and its flavor. The above discussion has dealt with the important role butter plays in sauce flavor. Butter also provides a smooth, creamy consistency to sauces, which can be attributed to the mixture of nonfat milk solids and fatty acids naturally present in butter. The nonfat milk solids provide butter with body and mouthfeel, which are then transmitted into the final sauce.

## FLAVOR CARRIER

Butter is unique in that it can also solubilize other flavors to create full-bodied condiments and uniquely flavored butters. Butter can solubilize sweet spices and vanilla for sweet sauces and toppings, and herbs and spices for

savory applications, for added flavor. Butter's ability to function as a flavor carrying agent has led to the development of numerous types of flavored butters which include, among others, dill, garlic and fennel. Manufacturers can create a wide variety of products simply by flavoring the butter itself or using the butter to solubilize other flavors.

## **EMULSIFICATION**

Lecithin is a natural emulsifier present at 0.24 percent in butter. Despite low natural concentration, butter lecithin is functionally active. The most important function in sauces is that it facilitates mixing fat- and water-based ingredients together, thus ensuring an even and complete distribution. Butter can sometimes be used as the sole emulsifier in sauces. Because butter has very few ingredients, manufacturers can display a clean label.

## **PREMIUM IMAGE**

Consumers often buy sauces made with real butter because of the high-quality, premium image butter conveys. Manufacturers can reap the benefits of this strong positive consumer association by emphasizing the all natural quality and upscale image of butter in "gourmet" and "all natural" sauces and in unique, premium spreads.

## **FUTURE POTENTIAL**

Butter's unique functional advantages make it an ideal ingredient in microwavable prepared sauces for use with pasta, vegetables and entrees. Butter's all natural quality also makes it ideal for use in the growing number of 100 percent natural products on the market and offers manufacturers the added advantage that they can provide a clean label declaration. Numerous ethnic sauces traditionally use butter, and as the market demand for ethnic food grows, the demand will result in an increased number of sauces made with butter.

## **STORAGE RECOMMENDATIONS**

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around room temperature (60-65°F; 16-18°C) without exceeding 70°F (21°C). During the thawing process, the product should be moved to ensure even thawing. One 68 pound block will thaw in approximately four to five days under these conditions.

### **TIPS FOR USAGE**

When using butter in sauce applications, butter should be added to the sauce mixture directly from refrigerated storage. If frozen butter is being used, the butter should be added directly to the sauce mixture after thawing.

# LIVEN UP CONDIMENTS

Characteristic	Properties	Benefits	Applications
<b>Flavor</b> Lactones 1-40 ppm Ketones 1-35 ppm	Adds characteristic butter flavor	Contributes a unique, rich buttery flavor with dairy notes for savory sauces	Creamy, white sauces and gravies
	Mandatory	Key to flavor in numerous white sauces	Bechamel, Bordelaise, Hollandaise sauces
		Full-flavored butter ideal for sweet toppings	Butterscotch, caramel
	Rich background notes	Provides a rich buttery flavor which complements other flavor notes	Tomato-based products, sweet sauces
	Increased flavor upon heating	Concentration of primary flavor compounds increases with higher temperatures resulting in creamy, dairy notes	Caramel toppings, tomato-based and creamy white sauces
	Can be heated to meet specific flavor needs:		
	<i>Light Melt</i>	Slowly melted to provide rich, buttery flavor	Pasta sauces, white and cheese sauces
	<i>Brown Melt</i>	Butter, which is slightly overheated during melting, provides roasted, cooked flavor notes which complement brown sauces	Gravies, brown sauces and meat sauces
	<i>Dark Brown Melt</i>	Overheated, unburned butter will provide flavor notes which complement smoked and barbecue flavors	Smoke-flavored and barbecue sauces
<b>Mouthfeel</b> Fatty Acids 80.67% Nonfat milk solids <1%	No waxy mouthfeel	Nonfat milk solids combined with fatty acids provide creamy, smooth mouthfeel to sauces	Gravies, meat and pasta sauces
<b>Flavor Carrier</b> Total lipids 81.11%	Flavor carrier	Butter can help distribute spices and fat-based flavors  Synergistic effect with herbs and other flavor notes to provide a full flavor profile	Pasta, tomato-based sauces  Meat, smoke-flavored sauces
<b>Emulsifier</b> Lecithin 0.24%	Natural emulsifier  Facilitates uniform distribution of all ingredients	Clean label declaration  Provides uniform mixture for good blending of fat- and water-soluble ingredients in same food system	All natural sauces  Tomato- and cream-based sauces, sweet toppings
<b>Quality</b>	Perceived as a value-added ingredient  All natural appeal	Attracts consumers because of high-quality, premium image  Ideal for use in upscale products  Multifunctional, all natural ingredient	Premium, gourmet items  All natural sauces

# CONFECTION PERFECTION

Numerous confections are made with butter, as it provides unique flavor and mouthfeel. Butter conjures images of upscale products of premium quality, and it provides numerous functional advantages to food manufacturers.

## FLAVOR

One of the many reasons butter is used in confections is because of the unique flavor it imparts. Butter's flavor can be attributed to over 120 different compounds, but the primary ones are methyl ketones (primarily diacetyl) and lactones. These compounds are naturally present in butter at concentrations below detection levels, or below their Flavor Threshold Value (FTV). Upon heating, their concentration rise above their respective FTV, resulting in a full, rich butter flavor with dairy notes. Lactones and methyl ketones work synergistically, contributing to the overall flavor of the cooked product. Confections which call for butter typically require heating the confectionery mass to bring out the full flavor and create a rich, buttery taste.

Butter also interacts with flavor components which result from Maillard reactions (browning reactions between sugars and proteins), creating flavor notes traditionally associated with caramels, pralines, and toffee. Most sources agree that a good quality caramel must be made using condensed milk and butter.

Butter is also unique in that it can function as a flavor carrying agent for other ingredients, including vanilla and sweet spices. Food manufacturers producing confections with cream centers can use butter to produce a myriad of new flavors while maintaining the desired texture of the filling.

## EMULSIFIER

Butter contains 0.24 percent lecithin, a natural emulsifier. Although naturally present in small quantities, it performs a variety of important functions in confectionery products. The lecithin in butter aids in the emulsification of fat and aqueous products which would otherwise not mix thoroughly. This is important for the mouthfeel of the product and it improves the overall product stability. In addition, emulsification aids in moisture control, thereby helping to extend the shelf life of many confectionery products.

The lecithin in butter is particularly important in helping to prevent stickiness in high sugar solutions, especially with products like taffy, caramels and toffee. Butter thus aids in simplifying the production of confections which otherwise might be difficult to handle.

## **MOUTHFEEL**

Butter characteristically has a sharp Solid Fat Index (SFI) curve which stems from butter's narrow melting range (82-99°F; 28-36°C). The sharp SFI curve of butter at these temperatures ensures quick flavor release and complete melting of butter at body temperatures, for a "melt-away" effect. This aids in smooth mouthfeel, which adds to the eating qualities and is of particular importance in confectionery products. Confections made with oils which have more broad SFI curve at these temperatures tend to have a waxy mouthfeel and do not offer pleasant chewing characteristics. In addition, they have poor flavor release as compared to confections made with butter.

Consumers view butter as a high-quality, premium and all natural ingredient. As such, manufacturers who incorporate butter in their confections can take advantage of this positive consumer image while also benefiting from the numerous functional advantages butter provides.

## **NEW TRENDS AND IDEAS**

As the technology to isolate specific fractions of butteroil improves, more and more manufacturers will begin to use butteroil to replace small amounts of cocoa butter, in an effort to modify pure cocoa butter formulations. Butteroil can be used to help prevent "fat bloom" in dark chocolate and to soften chocolate. Butter will continue to provide butterscotch products with their characteristic flavor and will add important functional properties to taffy, caramels and toffee.

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# CONFECTION PERFECTION

<b>Characteristic</b>	<b>Properties</b>	<b>Benefits</b>	<b>Applications</b>
<b>Flavor</b> Lactones 1-40 ppm Ketones 1-35 ppm	Imparts buttery overtones	Contributes a unique, rich buttery flavor which provides creamy quality to confections	Centers, toffees, caramels, truffles, pralines
		Enhances dairy notes of milk chocolate and milk-containing confections	Centers, truffles
	Provides special flavor notes	Butter reacts with the sugars and upon heating develops a flavor profile characteristic of caramels and toffees	Caramels, toffees, pralines, taffy
		Concentration of primary flavor compounds increases with higher temperatures resulting in creamy dairy notes in final product	
<b>Melting Range</b> 82.4-96.8°F 28-36 °C	Allows for complete flavor release	Sharp melting curve ensures quick release of butter flavor at body temperatures	Caramels, hard candies, truffles, centers, taffy
<b>Flavor Carrier</b> Total lipids 81.11%	Flavor carrier	Butter can carry other flavors, working synergistically for a full flavor profile	Centers, truffles, pralines
<b>Emulsifier</b> Lecithin 0.24%	Natural emulsifier	Obviates the need for other emulsifiers; clean label declaration	Caramels, centers, hard candies
	Facilitates uniform fat distribution	Aids in improving mouthfeel and emulsion stability	Centers, hard candies, toffees, taffy
	Slows moisture loss	Aids in slowing rate of moisture loss through emulsification properties	Centers, truffles
<b>Mouthfeel</b> 82.4-96.8°F 28-36°C	Contributes creamy mouthfeel	Sharp Solid Fat Index curves result in melt-away effect. No waxy mouthfeel; improves chewing properties	Hard candies, truffles, taffy, pralines, caramels, toffees
	Prevents stickiness in high sugar solutions	Provides for quick release in manufacturing	Taffy, caramels, hard candies, toffees
<b>Quality</b>	Adds to overall quality perception of products	Consumer perception of butter-containing products remains high	High-quality confections
	All natural appeal	100 percent natural, multifunctional ingredient	Wholesome, all natural confections

# DELECTABLE DAIRY DELIGHTS

Many of the ice cream products on the market are enhanced by the addition of variegates and particulates. Toffee bits and caramel swirls are only a few ingredients which turn ordinary ice creams into irresistible dairy sensations.

Butter is used extensively throughout the dairy industry in variegates, particulates, and toppings, primarily for its flavor.

Although there are over 120 different compounds that contribute to butter's unique flavor, the five primary elements responsible for butter's flavor include: fatty acids, lactones, methyl ketones, diacetyl and dimethyl sulfide. Methyl ketones and lactones are the primary components responsible for the "cooked" flavor associated with particulates and variegates (such as toffee and caramel) made with butter. Both of these compounds are present in fresh butter at levels which are below their Flavor Threshold Value (FTV) or below the concentration at which their taste is perceptible. Upon heating, however, the total concentration of both lactones and methyl ketones exceeds their FTV. The methyl ketones and lactones also interact with the flavors developed through the Maillard reactions (browning reactions between sugars and proteins) which occur during cooking.

Butter contributes to the "creamy" flavor of particulates and variegates, enhancing the overall consumer appeal of the product. Through its own unique flavor, butter contributes to the rich flavor of these ice cream ingredients.

## FLAVOR CARRIER

Butter functions as a flavor carrier for toppings, particulates and variegates. It can stabilize other flavors, including sweet spices, for example, yielding a full flavor profile. The narrow melting range of butter contributes to the quick release of flavors at body temperatures, resulting in a pleasing taste sensation.

## EMULSIFIER

Butter contains 0.24 percent lecithin, a natural emulsifier. Although present in small quantities, lecithin in butter aids in producing a homogeneous, stable emulsion. Lecithin works synergistically with other emulsifiers to ensure a final product which is stable and provides a pleasurable textural quality. It also helps manufacturers display a clean label when used as a natural emulsifier.

## INFLUENCE ON MOUTHFEEL

Butter's characteristically sharp melting curve ensures quick release of butter flavor at body temperatures resulting in a pleasing melt-away effect with no waxy mouthfeel. This melting process contributes to the "creamy," rich mouthfeel of ice cream ingredients, such as chocolate variegates and toffee particulates, and is important for the acceptability of chocolate and caramel toppings. The

mixture of nonfat milk solids and fatty acids in butter also provides a smooth, creamy consistency.

## **ADDED VALUE**

The high-quality image associated with real butter adds value to products which have been improved with the addition of butter-containing variegates and particulates. Real butter is a key ingredient in many upscale, gourmet ice cream toppings. Products containing real butter contribute to the overall appeal of the dairy item and raise it to a premium product category.

## **NEW IDEAS**

As the trend for upscale dairy items utilizing branded ingredients continues, more manufacturers will look to high-quality, butter-containing particulates and variegates to be added to their ice creams.

In addition, adding particulates and variegates to novelty bars is also a possibility. Adding these items to the dairy portion of the novelty bars, as well as to the coatings, will provide consumers with a textural sensation in every bite.

## **STORAGE RECOMMENDATIONS**

Butter should always be stored in original cartons, away from highly aromatic food, and in storage rooms with controlled humidity (80-85 percent). Bulk butter can be refrigerated (32-38°F; 0-3°C) for up to nine months or frozen (-10 to -20°F; -23 to -29°C) for up to eighteen months.

# DELECTABLE DAIRY DELIGHTS

Characteristic	Properties	Benefits	Applications
<b>Flavor</b> Lactones 1-40 ppm Ketones 1-35 ppm	Imparts buttery overtones	Contributes a unique, rich buttery flavor which provides creamy quality to ice cream ingredients	Particulates: toffee, pralines, candies  Toppings: butterscotch and praline
		Enhances dairy notes in variegates	Variegates: caramel, peanut butter, milk chocolate
	Provides special flavor notes	Butter interacts with flavors developed from browning reactions between sugars and proteins, to develop a characteristic flavor profile	Toppings: caramels, toffee, praline

<b>Melting Range</b> 82.4-96.8°F 28-36°C	Allows for quick flavor release	Sharp melting curve ensures quick release of butter flavor at body temperatures	Particulates: pralines, chocolate chips, toffee
			Variegates and toppings: caramel, fudge, chocolate

<b>Flavor Carrier</b> Total lipids 81.11%	Flavor carrier	Butter can carry and potentiate other flavors, working synergistically for a full flavor profile	Particulates: caramels, toffee, candies, pralines
			Variegates: peanut butter, chocolate and fudge
			Toppings: fudge, orange, toffee

<b>Emulsifier</b> Lecithin 0.24%	All natural	Clean label declaration	Particulates: caramels, pralines, toffee and candies
	Emulsification	Synergistic effect with other emulsifiers	Variegates: chocolate
	Facilitates uniform fat distribution	Aids in improving mouthfeel and emulsion stability	Toppings: caramel, toffee, flavored chocolate

<b>Mouthfeel</b> Melting Range 82.4-96.8°F 28-36°C	Contributes "smooth and creamy" mouthfeel	Sharp melting curve results in quick release of butter flavor, with no waxy mouthfeel	Particulates: toffee, chocolate chips, candies, pralines
			Variegates and toppings: caramel, marshmallow, fudge

<b>Added Value</b>	Adds to overall quality perception of products	Consumer perception of butter-containing products remains high	High-quality particulates, variegates and toppings
	All natural appeal	100 percent natural, multifunctional ingredient	Wholesome, all natural toppings and particulates

# EPICUREAN ENTREES

Butter has become an essential ingredient in numerous frozen entrees. Not only does butter provide a characteristic, unique flavor, it also provides important marketing advantages. It is recognized by consumers as a premium, high-quality, all natural ingredient. Butter also provides several functional attributes including mouthfeel and emulsification, and adds an upscale image to products.

## FLAVOR NOTES

Over 120 different compounds contribute to butter's flavor, but only two classes of compounds are responsible for the most characteristic flavor notes: methyl ketones and lactones. Both compounds are present in butter at levels below detection, or below their Flavor Threshold Value (FTV). When butter is heated, however, concentrations of both compounds rise above their FTV and the two compounds react synergistically, providing the rich, cooked butter flavor commonly associated with numerous entrees.

Butter works synergistically with other flavors and can provide a primary flavor in fish or poultry entrees. In fact, butter sauces have become a standard for fish entrees. Butter can also provide rich, background flavor notes in entree stuffings and sauces. Chicken Kiev is a classic example of this application.

Butter can be heated to different temperatures to provide cooked and smoked flavors that are often absent in microwavable foods. Slightly overheated butter ("brown" melt) creates roasted, cooked flavors which complement entrees with roasted meat or poultry and gravies. Butter, which is overheated to the "dark brown" melt stage, contributes smoked flavor notes which complement smoked fish and turkey entrees, as well as barbecue-style meals.

## FLAVOR CARRIER

Not only can butter provide its own unique flavor, but it also works well as a carrier for other flavor compounds. In entrees, butter aids in the even distribution of oil-soluble flavors throughout the product. In solubilizing these flavors, butter helps to retain the flavor within the product for fresh, rich notes when the product is prepared. Butter's flavor works well with both sweet and savory spices.

## EMULSIFIER

Lecithin is a natural emulsifier which is present in butter at levels below one percent. Even at low natural concentrations, lecithin provides important emulsification characteristics. Manufacturers may use butter as an all natural emulsifier. This is extremely helpful with keeping label declarations clean and simple. In entrees with sauces and stuffings which have both oil and water-

soluble ingredients, the lecithin in butter aids in dispersion of ingredients throughout the product.

## **MOUTHFEEL**

Not only is flavor and visual appeal important in entrees, but mouthfeel also presents an important role in product acceptability. The combination of nonfat milk solids and fatty acids in butter provides smooth mouthfeel, adding to the “rich and creamy” sensation associated with butter and thereby helping to increase product acceptability.

## **ADDED VALUE**

Butter holds a strong, positive image with consumers. It is considered to be a high-quality, upscale ingredient which is used in fine, gourmet items. Butter is also appealing because it is all natural, helping manufacturers meet the rising demand for healthy, all natural entrees. Manufacturers who use butter can take advantage of these positive product images and reap the benefits!

## **STORAGE RECOMMENDATIONS**

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# EPICUREAN ENTREES

Characteristic	Properties	Benefits	Applications
<b>Flavor</b> Lactones 1-40 ppm Ketones 1-35 ppm	Unmatched flavor	Unique butter flavor adds characteristic taste which is compatible with virtually any food	Fish, chicken, stuffed entrees
	Adds creamy dairy notes	Provides rich dairy notes which function as an excellent background flavor	Sauces, stuffings
	Increased flavor upon heating	Concentration of primary flavor compounds increases with higher temperatures resulting in creamy, dairy notes	Stuffed entrees, fish, chicken, pasta dishes, quiche
	Can be heated prior to use to provide specific flavors in microwavable foods:		
	<i>Light Melt</i>	Slowly melted to provide rich butter flavor	Pasta dishes, Chicken Kiev, quiche
	<i>Brown Melt</i>	Slightly overheated butter which provides roasted, cooked flavor notes to microwavable entrees	Roast beef, stuffed chicken, gravies, roasted meats
	<i>Dark Brown Melt</i>	Overheated, unburned butter provides smoked flavor notes to complement smoke flavored entrees and barbecue-style sauces	Smoked turkey and chicken, barbeque sauces
<b>Flavor Carrier</b> Total lipids 81.11%	Flavor carrier	Can function as a flavor carrier for sweet and savory spices	Pasta sauces and dishes, fish and entrees, light meat dishes
		Solubilizing spices ensures fresh, full flavor of product when consumed	
<b>Emulsifier</b> Lecithin 0.24%	Natural emulsification	Ensures even distribution of water and oil-soluble ingredients throughout the product; works synergistically with any other emulsifiers present	Stuffings, sauces, Chicken Kiev, quiche
<b>Mouth Feel</b> Fatty Acids 80.67% Nonfat milk solids <1%	Smooth mouthfeel	Nonfat milk solids combined with fatty acids provide smooth mouthfeel which adds to the "rich and creamy" sensation	Toppings in fish, poultry and meat entrees, fillings
<b>All Natural</b> 100% natural product	All natural appeal	A 100 percent natural ingredient ideal for use in healthy entrees	All natural, wholesome entrees
		All natural, multifunctional ingredient	
<b>Added Value</b>	Strong positive consumer image	Used to provide added market value and upscale image to entrees	Upscale, gourmet dinner entrees
		Butter associated with high-quality products made with fine ingredients	

# FLAVOR MAKES BELIEVERS

The perception of flavor is defined as "the quality of something that affects the sense of taste and smell" including odor, taste and mouthfeel (The Merriam-Webster Dictionary, Gulf and Western Corporation, NY).

Numerous factors play a role in the development of butter flavor, including the diet and breed of the cows, and the season and stage of lactation. In addition, more than 120 flavor compounds have been identified in butter.

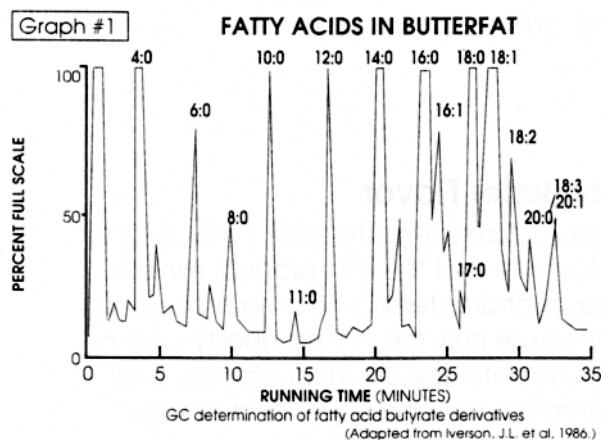
It is not completely understood to what degree or how all the flavor compounds in butter interact. However, there is general agreement that a few primary flavor compounds are the principal flavor components in butter including: free fatty acids, methyl ketones, lactones and dimethyl sulfide.

In the United States, butter production is primarily of the **sweet cream** variety. Topics covered herein focus on flavor related to sweet cream butter. Flavor aspects of **cultured butter**, which is significantly more popular in Europe, are mentioned only briefly.

## Free Fatty Acids

Flavorful fatty acids play an important role in the flavor of butter and are present at varied concentrations. Although long-chain fatty acids are present at higher concentrations in butter, they do not make a significant contribution to flavor. Short-chain fatty acids (SCFA), on the other hand, do play an important role in butter's flavor.

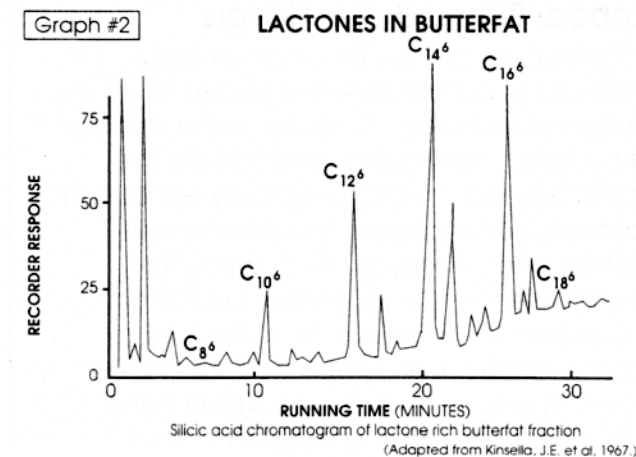
Typically, SCFA are found in the serum portion of butter (aqueous solution of all non-fat components) where their flavor potential is stronger. They occur below their Flavor Threshold Value (FTV): the minimum concentration level below which aroma or taste is imperceptible. Despite low concentrations, SCFA react in a synergistic and additive manner to provide characteristic flavors found in butter. Butyric acid is the most widely known and most potent SCFA and is attributed to providing intensity to fatty acid-type flavors associated with butter. Butter also contains a variety of fatty acid precursors of 4-cis-heptenal, a compound which provides butter with a creamy flavor.



It is also important to note that butter contains very low levels of *trans* fatty acids.

## Lactones

In fresh butter, precursors to lactones and free lactones exist in small concentrations. Free lactones exist in the lipid phase of butter, where they have higher threshold values. Despite their low concentration in fresh butter, free lactones are important flavorants, which act in an additive manner to impart the perceptible sweet, fruity flavors characteristic of butter. Upon heating, the lactone precursors are converted to lactones and their total concentration rises above their FTV. Thus, they provide the rich flavor notes commonly associated with heated foods containing butterfat. Lactones in butter are also the major source of flavor in confections and high-quality candies where they provide the unique, pleasurable flavors associated with these products.



## Methyl Ketones

Methyl ketones exist in their precursor form in fresh butter as alkanolic acids. As such, they may be only marginally important in contributing to the flavor of fresh butter. However, when heated, the precursors are converted to methyl ketones and their total concentration rises above their FTV. Thus they are very important in providing flavors associated with heated or cooked foods containing butter. Diacetyl is another ketone flavorant and is very important in providing the rich or heated note in butter flavor. Diacetyl is also the primary flavor compound in starter cultures and distillates which are used in producing cultured butter.

## Dimethyl Sulfide

Dimethyl sulfide is originally derived from the feed of cows and occurs in butter at concentrations above its FTV. Dimethyl sulfide helps to smooth the

harsher flavor notes of diacetyl and other acidic substances in butter and is also largely responsible for the freshly cooked note associated with freshly churned butter.

### **Other Flavor Constituents**

Although the exact role of aliphatic aldehydes in butter flavor has not been defined, it is known that they are important. They are typically present in concentrations below their FTV, particularly since they have low thresholds and produce desirable “creamy, buttery flavor” at very low concentrations. At high concentrations, they lead to the oxidized off-flavors associated with butter oxidation. Aldehydes can also be found in butter cultures used in the manufacture of **cultured butter**.

Indole and skatole are two additional flavor compounds which are present in butter and which contribute to its flavor. Phenol and cresol are of borderline significance but also play a role in the flavor of butter.

### **Developed, Baked Butter Flavors**

The above compounds, and numerous others, interact to contribute to the unique flavor of fresh, sweet cream butter. However, butter also has a variety of flavor compounds which create the developed, baked butter flavor typically associated with croissants, butter cookies and other baked goods using butter. Although the compounds which contribute to this unique flavor are not completely understood, it is believed that they are a combination of the flavor compounds developed from browning reactions which occur both in the dough and in butter. These developed baked flavor compounds are delicate and have an extremely high value for food manufacturers.

### **Fried Butter Flavors**

Butter also develops specific flavor compounds when it is used in frying applications. The reaction flavors, which are produced in the process, are highly unique to butter. Scientists believe that the flavor compounds which impart this unique flavor develop during cooking and are comprised of non-fat components from the serum phase of butter which interact with flavor derivatives of the fat phase.

As mentioned earlier, factors which affect and create butter flavor are not clearly understood. Butter flavor is very complex, and research which has been published to date only scratches the surface of what is left to learn about this system. This is one of the reasons butter’s flavor remains irreplaceable. Sweet cream butter is compatible with virtually any food, and will continue to provide unique, delicious flavor to sauces, entrees, baked goods, side dishes, and confections. In addition, real dairy butter is all natural and provides

manufacturers with numerous functional advantages which many artificial flavors cannot provide.

### **Flavor of Cultured Butter**

Cultured butter, although not a large percentage of butter production in the United States, differs in flavor from sweet cream butter. Cultured butter has a more pronounced, distinct flavor which stems from starter cultures that are added to the cream during churning. As a result, flavor compounds from cultured butter are superimposed on those of sweet cream butter, creating a full-flavor effect. Starter cultures are typically mixtures of flavor concentrates produced by one strain or mixed strains of bacterial cultures. Streptococcus diacetilactis produces diacetyl, the flavor most commonly associated with flavored butter and Streptococcus lactis is used to produce lactic acid, which contributes to the acidic flavor typically associated with cultured butter.

### **Caring for Butter Flavor**

Manufacturers of butter work carefully and diligently to ensure that the final product exhibits premium flavor characteristics. During processing, manufacturers use only the highest quality cream and carefully monitor the churning process. They store butter before shipping under strict storage conditions.

Food manufacturers using butter must also work carefully to ensure that the maximum flavor potential of the ingredient is maintained. Butter should be stored in dry, tightly sealed, poly-lined cartons, away from highly aromatic food. Storage rooms should have controlled humidity of 80-85 percent. Butter stored under refrigeration can be kept for up to nine months at 32-38°F (0-3°C) and for up to eighteen months at -10 to -20°F (-23 to -29°C).

# **SUPERB SIDE DISHES**

For a long time, frozen side dishes have used butter because of its unique, delicious flavor. The rich flavor butter imparts has led to its becoming an integral ingredient in sauces which accompany side dishes, in stuffings and in soups. Butter not only provides its own characteristic flavor, but provides several important functional characteristics as well, including emulsification, mouthfeel and nutrition. It is an ingredient which consumers recognize for its quality and which adds value to any product.

## **THE FLAVOR FACTOR**

Numerous compounds, over 120, contribute to the unique, irreplaceable flavor of butter. Of these compounds, two classes provide the most characteristic flavor notes: methyl ketones and lactones. They are typically present in fresh butter at levels below detection, or below their Flavor Threshold Value (FTV). Upon heating, their concentration increases above their FTV, giving rise to the rich dairy notes typically associated with products cooked with butter.

Butter is particularly advantageous because it works well both as a primary flavoring agent and for background flavor notes. In many side dish applications, butter is the ingredient of choice for manufacturers wishing to add a unique, delicious flavor profile. Vegetable side dishes, in particular, often use butter as an ingredient in cream sauces and gravies.

For applications in which rich background flavor notes are needed, as in cream soups, stuffings and rice dishes, butter provides the dairy notes which work synergistically with other flavors in the system. Butter works well in both sweet and savory applications.

Heating butter to different temperatures creates flavor profiles and provides unique flavors applicable to certain products. "Light melt" butter is ideal for rice dishes and butter sauces on vegetables. "Brown melt" butter adds cooked flavor notes which are often absent in microwavable foods and which complement stuffings and vegetables in gravy.

## **FLAVOR CARRIER**

Because butter can solubilize other flavor compounds, it functions as an all natural flavor carrier, ensuring that the final product will have a fresh, full flavor when consumed.

## **MOUTHFEEL**

The second most important characteristic of a food, after flavor, is mouthfeel. Butter plays an important role in increasing the acceptability of numerous side dishes by providing a smooth, rich mouthfeel. The nonfat milk solids in butter, combined with the fatty acids, function synergistically to provide

butter with a smooth consistency, which adds palatability to numerous vegetable side dishes and adds to the creamy consistency of sauces used therein.

## **FREEZE-THAW STABILITY**

Of particular importance to microwavable side dishes is butter's excellent performance through freeze-thaw cycles. Freezing and subsequent microwave or conventional heating does not alter butter's delicious flavor or its characteristic mouthfeel.

## **EMULSIFICATION**

Butter naturally contains 0.24 percent lecithin, a natural emulsifier. Even at naturally low concentrations, the lecithin in butter aids in the dispersion of water and fat-soluble ingredients throughout the product. Manufacturers may use butter as an all natural emulsifier, which is extremely helpful in clean label declarations.

## **VALUE-ADDED APPEAL**

Butter boasts a unique positioning with consumers. Not only do they recognize butter as being a high-quality, premium ingredient, but products which contain butter are typically identified as upscale and made with fine ingredients.

Butter offers manufacturers the all natural advantage, helping meet the rising demand for wholesome, preservative-free products. Manufacturers who take advantage of butter's unique functional properties and positive ingredient image are sure to reap the benefits.

## **STORAGE RECOMMENDATIONS**

Butter should always be stored in original cartons, away from highly aromatic food and in storage rooms with controlled humidity (80-85 percent). Bulk butter can be refrigerated (32-38°F; 0-3°C) for up to nine months or frozen (-10 to -20°F; -23 to -29°C) for up to eighteen months.

## **THAWING BUTTER**

Only butter which is intended for immediate use should be thawed.

When thawing frozen bulk butter, chimney stack the butter boxes or distribute around a room with controlled relative humidity (not exceeding 20 percent) and with good ventilation (preferably air conditioning). Temperature should be kept around room temperature (60-65°F; 16-18°C) without exceeding 70°F (21°C). During the thawing process, the product should be moved to ensure even thawing. A 68 pound block will thaw in approximately four to five days under these conditions.

# SUPERB SIDE DISHES

Characteristic	Properties	Benefits	Applications
<b>Flavor</b> Lactones 1-40 ppm Ketones 1-35 ppm	Unique, irreplaceable flavor	Characteristic butter flavor provides unmatched flavor notes which complement numerous savory and sweet dishes	Vegetables in butter sauce, stuffings, rice mixes
	Creamy background notes	Dairy notes provide ideal "rich and creamy" background flavor	Soups, creamy vegetable dishes
	Excellent compatibility	Functions equally well with savory and sweet flavor systems	Yams, corn, sweetened cabbage, stuffings, soups
	Flavor concentration	Upon heating, concentration of flavor compounds increases above threshold value	Microwavable side dishes, soups, rice dishes
		Synergistic interaction with other flavors in a system	Stuffings, vegetable dishes
	Can provide specific flavors to match individual needs:		
	<i>Light Melt</i>	Slowly melted to provide rich butter flavor	Vegetables in butter sauce, rice dishes
	<i>Brown Melt</i>	Slightly overheated butter to provide roasted, cooked flavor notes	Stuffings, yams in sauce, vegetables with gravy
<b>Flavor Carrier</b> Total lipids 81.11%	Solubilizes other flavors	Solubilizes sweet and savory spices for fresh, full flavor when consumed	Cream soups, stuffings, vegetables in cream and sweet sauces
<b>Mouth Feel</b> Fatty acids 80.67% Nonfat milk solids <1%	Provides rich, creamy mouthfeel	Combination of nonfat milk solids and fatty acids contributes to smooth, rich mouthfeel associated with butter	Cream soups, vegetables in butter sauce, gravies
<b>Stable</b> Total lipids 81.11%	Freeze-thaw stable	Performs well through freeze-thaw cycles	Microwavable side dishes
<b>Emulsifier</b> Lecithin 0.24%	Natural emulsifier	Ensures even distribution of water and oil-soluble ingredients throughout the product; works synergistically with any other emulsifiers present	Stuffings, cream soups and sauces
<b>Added Value</b>	Accepted as value-added	Recognized by consumers as an upscale, high-quality ingredient	Premium vegetable lines, gourmet products
		Products with butter linked directly with high-quality, fine ingredients	
<b>All Natural</b>	100 percent natural	Ideal for use in preservative-free products	Preservative-free dishes, all natural products
		All natural, multifunctional ingredient	