OPIC
Office de la propriété intellectuelle du Canada

CIPO
Canadian Intellectual Property Office

(12) (19) (CA) **Demande-Application**

(21) (A1) **2,233,545**
(86) 1996/10/23
(87) 1997/05/01

(72) MERCHANT, Zohar Mohamed, US
(72) SADURAL, Susie Adlawan, US
(72) CHENG, Shu Guang Greg, US
(72) WILLIAM-PRINCE, Joanne, US
(72) BARBER, Deborah Diane, US
(71) KRAFT FOODS, INC., US

(51) Int.Cl.[6] A23L 1/307, A23L 1/24, A23L 1/187, A23C 13/12, A23C 19/093, A23C 19/076, A23C 11/00
(30) 1995/10/27 (08/549,249) US
(30) 1996/10/22 (08/734,786) US

(54) **PRODUITS ALIMENTAIRES SANS MATIERE GRASSE ET A FAIBLE TENEUR EN MATIERE GRASSE A FLAVEUR AMELIOREE**

(54) **NO-FAT AND LOW-FAT FOOD PRODUCTS WITH IMPROVED FLAVOR**

(57) L'invention concerne la production de produits alimentaires à teneur réduite en matière grasse d'une flaveur améliorée. Le terme "produit alimentaire à teneur réduite en matière grasse" utilisé ici concerne les produits alimentaires présentant les qualités requises pour porter la mention sans matière grasse (moins de 0,5 grammes de matière grasse par portion), et les produits alimentaires présentant les qualités requises pour porter la mention faible teneur en matière grasse (moins de 1,68 grammes de matière grasse par once). Le procédé de l'invention permet d'obtenir un produit alimentaire initial à teneur réduite en matière grasse. Le produit alimentaire initial à teneur réduite en matière grasse présente une teneur en matière grasse inférieure à celle requise pour un produit alimentaire sans matière grasse ou un produit alimentaire à faible teneur en matière grasse. On mélange le produit alimentaire initial à teneur réduite en matière grasse avec un équivalent en émulsion à teneur élevée en matière grasse du produit alimentaire à teneur réduite en matière grasse afin d'obtenir un produit alimentaire final à teneur réduite en matière grasse d'une flaveur améliorée. On ajoute l'équivalent en émulsion à teneur élevée en matière grasse au produit alimentaire initial à teneur réduite en matière grasse à des niveaux tels que le produit alimentaire final à teneur réduite en matière grasse présente toujours les qualités requises d'un produit alimentaire portant la mention soit sans matière grasse soit à faible teneur en matière grasse.

(57) The present invention is directed to producing reduced fat food products with improved flavor. The term "reduced fat food product" as used herein is meant to include both those food products which qualify for being labeled fat free (less than 0.5 grams of fat per serving) and those food products which qualify for being labeled low fat (less than 1.68 grams of fat per ounce). In the method of the invention, an initial reduced fat food product is provided. The initial reduced fat food product has a fat content below that required for a fat free food product or a low fat food product. The initial reduced fat food product is blended with a high fat emulsion counterpart of the reduced fat food product to provide a final reduced fat food product with improved flavor. The high fat emulsion counterpart is added to the initial reduced fat food product at levels such that the final reduced fat food product still qualifies to be labeled either a fat free food product or a low fat food product.

**PCT** WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

**(51) International Patent Classification 6 :** A23C 9/137, 9/154

A1

**(11) International Publication Number:** WO 97/15197

**(43) International Publication Date:** 1 May 1997 (01.05.97)

**(21) International Application Number:** PCT/US96/17101

**(22) International Filing Date:** 23 October 1996 (23.10.96)

**(30) Priority Data:**

| | | |
|---|---|---|
| 08/549,249 | 27 October 1995 (27.10.95) | US |
| 08/734,786 | 22 October 1996 (22.10.96) | US |

**(71) Applicant:** KRAFT FOODS, INC. [US/US]; 250 North Street, White Plains, NY 10625 (US).

**(72) Inventors:** MERCHANT, Zohar, Mohamed; 3101 Hill Lane, Wilmette, IL 60091 (US). SADURAL, Susie, Adlawan; 3510 Regent Drive, Palatine, IL 60067 (US). CHENG, Shu, Guang, Greg; 102 East Hintz Road, Arlington Heights, IL 60004 (US). WILLIAM-PRINCE, Joanne; 174 East Wildflower Lane, Round Lake Beach, IL 60073 (US). BARBER, Deborah, Diane; 1987 Oxford Lane, Hoffman Estates, IL 60195 (US).

**(74) Agents:** WRIGHT, Debbie, K. et al.; c/o Tom Savoie, Kraft Foods, Inc., Patent Legal Dept., 250 North Street, White Plains, NY 10625 (US).

**(81) Designated States:** AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

**Published**
*With international search report.*

**(54) Title:** NO-FAT AND LOW-FAT FOOD PRODUCTS WITH IMPROVED FLAVOR

**(57) Abstract**

The present invention is directed to producing reduced fat food products with improved flavor. The term "reduced fat food product" as used herein is meant to include both those food products which qualify for being labeled fat free (less than 0.5 grams of fat per serving) and those food products which qualify for being labeled low fat (less than 1.68 grams of fat per ounce). In the method of the invention, an initial reduced fat food product is provided. The initial reduced fat food product has a fat content below that required for a fat free food product or a low fat food product. The initial reduced fat food product is blended with a high fat emulsion counterpart of the reduced fat food product to provide a final reduced fat food product with improved flavor. The high fat emulsion counterpart is added to the initial reduced fat food product at levels such that the final reduced fat food product still qualifies to be labeled either a fat free food product or a low fat food product.

# NO-FAT AND LOW-FAT FOOD PRODUCTS WITH IMPROVED FLAVOR

## Cross-Reference to Related Application

This is a continuation-in-part application of application Serial No. 549,249 filed October 27, 1995.

## Field of the Invention

The present invention relates generally to a reduced fat food product which has a high fat emulsion counterpart, and to a method for manufacture thereof. More particularly, the method includes the steps of providing an initial reduced fat product having less fat than that desired or permitted in the final food product. The initial reduced fat food product is then combined with an effective amount of a high fat emulsion counterpart to provide a final reduced fat food product with improved flavor.

## Background of the Invention

In accordance with the Standards of Identity of the Food and Drug Administration, to be labeled fat free, a food product must have less than 0.5 gram of fat per serving. The serving size depends on the type of food product and, consequently, the percentage level of fat permitted varies with the type of food product to be marketed as a fat-free food product. Food products having less than 1.68 grams of fat per ounce may be marketed as a low-fat food product. This corresponds to a fat content in the food product of less than 6% by weight. The present invention is directed to a no-fat or low-fat food product having from about 0.5% fat to less than 6% fat.

There have been considerable technical efforts directed to providing reduced fat food products which have the texture, smoothness and organoleptic properties of high fat counterparts. With increasing consumer awareness, the focal point is on reducing fat and calorie

consumption. Low fat, low calorie foods which look and taste similar to their full fat, higher calorie counterparts are eagerly sought by the consumer. Researchers in the food industry have concentrated on developing food products which are nutritious and palatable, containing substantially reduced levels of high calorie fat containing ingredients. Many reduced fat food products are intended to mimic in appearance, taste and texture, conventional well known products that have a high fat content.

The high fat levels in some dairy products, such as cream cheese, which has a fat content of at least about 33%, have been thought to be necessary to maintain a desirable creamy mouthfeel and to avoid the grainy texture associated with prior attempts at producing low fat cream cheese products.

Many efforts have been made to develop imitation cream cheese products which contain reduced fat levels. Examples of such efforts are disclosed in U.S. Patent 2,161,159 to Lundstedt, et al. and U.S. Patent 3,929,892 to Hynes, et al. However, the fat content of the cream cheese products produced by the methods of these patents still exceeds about 10% fat. It would be desirable to reduce the fat content well below 10%. In particular, it would be highly desirable to provide a no-fat cream cheese product.

More recently, methods have been developed for making very low butterfat content imitation cream cheese products having a low calorie content which are intended for diet conscious consumers. U.S. Patent No. 4,244,983 to Baker and U.S. Patent 4,379,175 to Baker disclose imitation cream cheese products and a method for their manufacture having butterfat content of less than about 5%, preferably less than about 2% and which have about 60 calories per serving. However, as admitted by the inventor of these patents, as set forth in U.S. Patent

4,724,152 to Baker, that, while the very low butterfat content of these products is desirable, the products do not closely duplicate the creamy and full-bodied consistency of full fat cream cheese.

U.S. Patent No. 4,724,152 to Baker describes a method for making a low fat cream cheese product. The method includes the steps of admixing milk, a fat-containing carrier and no-fat dry milk solids to form a dressing mixture. The dressing mixture is pasteurized and homogenized and is thereafter heated to a temperature in the range of from about 145° F. to about 195° F., preferably 165° F. to 190° F., with constant agitation. A stabilizer is admixed into the mixture. Thereafter, while maintaining the temperature of the mixture in a range of 150° F. to 175° F., soft unripened cultured cheese curd, such as cottage or baker's cheese curd is added to the stabilizer-containing dressing mix. The admixture is pumped to a homogenizer where it is homogenized under conventional elevated pressure conditions of 500 to 5000 psig, preferably 1500 to 3000 psig. Following homogenization, the imitation cream cheese product, at temperatures of at least 40° F., is packaged into convenient packages.

While the '152 Baker patent provides a cream cheese product with reduced fat, i.e., a fat level in the range of 2 to 9% by weight, the Baker patent does not provide a no-fat cream cheese product.

U.S. Patent No. 5,202,146 to Singer, et al. is directed to a flavor delivery system for low-fat food products which include cream cheese type products.

U.S. Patent No. 5,180,604 to Crane, et al. and 5,079,024 to Crane are directed to no-fat cream cheese having less than about 1.5% fat. The teachings of these patents, which are incorporated herein by reference, are essential. The Crane and Crane, et al. patents describe methods for combining concentrated skim milk sources,

such as a skim milk retentate, other no-fat milk protein sources and a bulking agent with an emulsifying salt and various gums in a series of steps to produce a no-fat cream cheese that resembles a reduced fat or full-fat cream cheese in texture, taste and mouthfeel.

U.S. Patent No. 5,011,701 to Baer, et al. is directed to a method for preparing a substantially fat free food product, such as pourable and viscous dressings. The method utilizes microreticulated microcrystalline cellulose (MRC) as a fat mimetic.

U.S. Patent No. 5,215,778 to Davison, et al. is directed to providing substantially fat free cheese slice products utilizing MRC as a fat mimetic.

Accordingly, it is a principal object of the present invention to provide a no-fat and low-fat food product, having the appearance, taste, consistency and texture of a high fat emulsion counterpart.

It is another object to provide a method for making an imitation cream cheese product which has a low level of fat and which is adapted to large scale commercial operations.

These and other objects of the invention will become more apparent from the following detailed description.

## Summary of the Invention

The present invention is directed to producing reduced fat food products with improved flavor. The term "reduced fat food product" as used herein is meant to include both those food products which qualify for being labeled fat free (less than 0.5 grams of fat per serving) and those food products which qualify for being labeled low fat (less than 1.68 grams of fat per ounce). In the method of the invention, an initial reduced fat food product is provided. The initial reduced fat food product has a fat content below that required for a fat free food product or a low fat food product. The initial

reduced fat food product is blended with a high fat emulsion counterpart of the reduced fat food product to provide a final reduced fat food product with improved flavor. The high fat emulsion counterpart is added to the initial reduced fat food product at levels such that the final reduced fat food product still qualifies to be labeled either a fat free food product or a low fat food product.

## Detailed Description of the Invention

High fat emulsion food products, have a blend of fat, protein, emulsifiers and other aqueous phase components which result in the appropriate partitioning of the components contributing to flavor between the fat phase and aqueous phase. As a result, upon consumption of full-fat cream cheese, for example, the desired flavor release perception is attained. In a fat-free cream cheese, the absence of significant amounts of fat (down from about 34% to less than 1.5%) leads to alteration in the partitioning/release and lack of a cultured and creamy flavor. This leads to a perception of fruity, chemical, artificial off-flavors and harshness resulting in an undesirable flavor. Incorporation of full-fat cream cheese where the desirable flavor molecules arising from the cultured milk and other sources have had a chance to partition and equilibrate between the fat and aqueous phases, when blended at low levels with a fat-free cream cheese leads to (1) reduction in the off-flavor, (2) reduces the harshness, and (3) contributes some of the desirable cultured/cream flavor to the fat-free cream cheese. This provides a fat-free cream cheese product having a superior flavor character and improved overall acceptance.

The significant and novel discovery of the present invention is that the addition of low levels of a high fat emulsion counterpart to a reduced fat food product which has a high fat emulsion counterpart imparts

a disproportionate and highly enhanced flavor improvement. The reduced fat emulsion is prepared with a level of fat which is less than desired or permitted in the final reduced fat food product. The high fat emulsion counterpart is then combined with the initial reduced fat food product at a level which is effective to provide a final reduced fat food product that still qualified to be labeled either a fat free food product or a low fat food product.

The high fat emulsion counterpart may have the same fat level, a lower fat level or higher level of fat and may have the same flavor level, an enhanced flavor level or a reduced flavor level as compared to the normal fat and flavor of the high fat emulsion counterpart. The high fat emulsion counterpart provides a vehicle wherein flavors are partitioned and equilibrated between the fat phase and the water phase of the emulsion. The principle of adding a small amount of a high fat emulsion counterpart to a reduced fat food product can be applied to a diverse number of reduced fat food products, which have full-fat emulsion counterparts. These include cream cheese, viscous dressings, such as mayonnaise-type dressings, pourable dressings, such as ranch type dressings, process and natural cheese, dairy and non-dairy dessert toppings, puddings and coffee whiteners.

The initial reduced fat food products of the invention have from 0% to about 5.5% total fat. The high fat emulsion counterparts have from about 20% to about 80% fat. The high fat emulsion counterpart is generally present in the final reduced fat food product at a level of from about 0.625% to about 30%. The final reduced fat food product will have a fat level of from about 0.5% to about 6.0%. All percentages used herein are by weight unless otherwise indicated. The high fat emulsion counterpart will usually be an oil-in-water emulsion.

However, multi-emulsions such as water-in-oil-in-water emulsions, can also be used.

The fat in the high fat emulsion counterpart can be any suitable vegetable oil or hard fat. Suitable fats and oils include soybean oil, hydrogenated soybean oil, corn oil, cottonseed oil, palm kernel oil, coconut oil, cocoa butter, olive oil, rape seed oil, sunflower oil, neobee oil, butterfat, butterfat fractions and mixtures thereof. The emulsifiers in the high fat emulsion counterpart can be any suitable well known emulsifier. Such known emulsifiers can be protein based, lipid based or carbohydrate based.

The proposed mechanism of flavor perception is determined by several aspects, namely, the nature and amounts of partitioning of the volatile odor and non-volatile taste components present and availability of these components to the sensory system as a function of time. This is dependent on (a) breakdown through mastication, (b) convective transport of the released volatiles via the respiratory cycle, (c) binding to the components present in the food matrix, and (d) diffusion through the food matrix.

Reducing the fat in the food while maintaining the overall taste is a monumental challenge. This is due to the multiple functions that fat plays in a given food system. These include acting as a source of flavor, modulator of flavor and the release and uptake of the flavor. Combinations of ingredients may be needed for different fat functions. Reducing the fat levels in food, with the corresponding change in the rest of the ingredients present, alters the product environment; resulting in destroying the original balance. The non-fat and low fat food products of the present invention may be made using any of the known fat mimetics. These include protein/gum systems, microcrystalline cellulose,

protein based carbohydrate based and lipid based fat mimetics either individually or in combination.

The consequences of fat reduction are alteration in the compatibility of flavor with the product, change in flavor balance and perception of off-flavors from the base. The timing and amount of flavor release may be altered. The challenge is to get the right flavor balance and release to achieve the desired flavor perception.

U.S. Patent 5,202,146 to Singer, et al. discloses a flavor delivery system comprising fat globules into which elevated levels of fat soluble flavor compounds have been loaded. The flavor delivery system is incorporated into no-fat and low-fat food products so that fat soluble flavor compounds are released. Incorporation of flavor in fat globules does not assure that the flavor will retain its character upon food processing. During processing, high temperatures or shear or vacuum or deaeration may be experienced resulting in changes in added flavor. Secondly, the oil soluble flavor alone is not the only factor in improving the flavor of the product. Water soluble flavors also play a role. Additionally, the interaction of these oil soluble and water soluble components and their partitioning between the oil/water/vapor phase, the interactions with the matrix, i.e., binding, entrapment and diffusion, contribute to the overall desirable flavor characteristics. Thirdly, some of the desirable flavors are produced *in situ* as in cheeses (i.e., enzymatic reactions/microbial reactions) or salad dressings (i.e., oxidation). Fourthly, it is very difficult to compound a full-fat cheese or salad dressing flavor or other full-fat product flavors, since they are very complex.

The use of a high fat emulsion counterpart which provides *in-situ* generation of the flavor within the full-fat emulsion counterpart provides significant

advantages and significantly superior flavors for application in reduced fat food products which have a high fat emulsion counterpart versus the addition of fat soluble flavors in a fat globule delivery system. Additionally, the high fat emulsion counterpart allows superior oil/water/vapor partitioning of flavor, interaction with the matrix components and stable microenvironment for the flavor components. The net effect upon equilibration is desired flavor. Hence the high fat emulsion counterpart serves not only as a source of flavor, but also as a carrier/modulator of the flavor.

The high fat emulsion counterpart can also serve as a vehicle to enhance or accelerate generation of flavors through application of heat or mechanical working. The flavor generation can be further enhanced by adding from about 0.02% to about 0.1% of a sulfur containing amino acid (such as cysteine or methionine) to the high fat emulsion and heating the final reduced fat food product to a temperature of from about 110° F. to about 190° F.

It has been shown for salad dressings (viscous and pourable) and cheeses (cream cheese, process cheese slices and loafs) that addition of very small amounts of the high fat emulsion counterpart of the same family provides a highly desirable and improved flavor.

It was observed that addition of high fat cream cheese in the preparation of a reduced fat cream cheese provides reduction of off-flavor, the perception of desirable cultured cream attributes and reduction in the harshness/chemical perception of added flavor top notes. In the case of process cheese, the addition of high fat process cheese to a reduced fat process cheese reduced the bitterness and objectionable aftertaste as well as providing increased flavor stability in the no-fat and low-fat process cheese. In the case of no-fat or low fat salad dressing, the addition of high fat viscous salad

dressing imparted desirable oil, egg and dairy flavor attributes and reduced the cardboard/chemical off-flavor in the no-fat and low-fat viscous salad dressing.

In another embodiment of this invention, it was found desirable to greatly increase the intensity of some of the positive flavor attributes, i.e., oil, egg, dairy, etc., in the high fat emulsion counterpart. Towards this end, a flavor enhanced high fat emulsion counterpart, such as mayonnaise-type salad dressings which deliver increased oil, egg and dairy flavor attributes was prepared. The level of flavor was such that the enhanced flavor full-fat emulsion counterpart was unpalatable and could not be consumed on an as-is basis.

In another embodiment of this invention, a high fat salad dressing which contained a starch base was made. This imparted a different flavor perception.

In another embodiment of this invention, it may be necessary to reduce the flavor components in the high fat emulsion counterpart. In this case, a high fat emulsion counterpart was made with some of the flavors reduced for use in reduced fat food products having a full fat emulsion counterpart.

The following examples further illustrate various features of the present invention, but is intended to in no way limit the scope of the invention, which is defined in the appended claims.

Example 1

Conventional high fat cream cheese is a soft, mild acid-coagulated uncured cheese made of cream from a mixture of cream and milk. Cream cheese is stored under refrigeration conditions and the body of cream cheese is smooth and butter-like. The texture and body of cream cheese at refrigeration temperatures is such that the cream cheese can be sliced and spread. After processing, the finished cream cheese has a butterfat content of from

about 33% to about 35% by weight. Reduced fat cream cheese has a butterfat content of from about 18% to about 24%.

In making conventional high fat cream cheese, sweet whole milk and/or skim milk and sweet cream are blended in pre-selected proportions to form a cream cheese mix. The cream cheese mix normally has a butterfat content of from about 10% to about 14%. The cream cheese mix is pasteurized and homogenized after which it is cooled, usually to a temperature between 62° F. and 92° F. and is then inoculated with a lactic acid culture. Rennet may be used to aid the coagulation of the mix. The mix is held at the inoculation temperature until it has ripened and a coagulum is formed. The acidity of the coagulum is from about 0.6% to about 0.9% (calculated as percent equivalent lactic acid).

After the desired acidity is obtained, the curd is separated from the whey and is thereafter packaged. One well known process for making cream cheese and separating cream cheese curd from whey includes a mechanical separation of the curd. This process is disclosed in U.S. Patent No. 2,387,276 to Link. In accordance with the method of the Link patent, after the mix is ripened to form a coagulum, the coagulum is heated to an elevated temperature to break the viscosity of the mix. Thereafter, the heated mix is centrifuged at the elevated temperature to separate the curd from the whey to provide the high fat cream cheese.

An initial reduced fat cream cheese was prepared in accordance with the invention using the following method of U.S. Patent No. 5,079,024 to Crane. Skim milk retentate was retained in a holding tank at a temperature of 72° F. The retentate was inoculated with a culture of *S. lactis* and was fermented for a period of 16 hours until a pH of 5.0 was reached. 1474.9 pounds of

the fermented skim milk retentate were then transferred to a Breddo$_{TM}$ mixer having a capacity of 300 gallons. The mixer was turned on and 202.6 pounds of dry curd cottage cheese held at a temperature of 40° F. was added to the mixer. 18.8 pounds of tripolyphosphate salt was added to the mixer and agitation and recirculation through a recirculation loop was continued for 3 minutes. At this time, steam at a pressure of 45 psig was injected into the recirculating loop to increase the temperature from 70° F. to 180° F. 58.8 pounds of no-fat dry milk, 5.9 pounds of xanthan gum, 7.5 pounds of salt, 17.6 pounds of sugar, 6.3 pounds of titanium dioxide, 1.2 pounds of potassium sorbate, 1.0 pound of calcium propionate, 1.8 pounds of carrageenan, 0.32 pounds of Vitamin A palmitate and 0.02 pounds of oleoresin paprika was added as the temperature was being increased.

After reaching a temperature of 185° F., 40.5 pounds of conventional high fat cream cheese (34% butterfat) and 2.0 pounds of dairy flavor were added to the initial reduced fat cream cheese to produce a final cream cheese product. The level of high fat cream cheese addition was 2.0% of the total final reduced fat cream cheese product. Steam injection was stopped after reaching a temperature of 185° F. Agitation of the mixture was continued for 3 minutes.

The final reduced fat cream cheese product resulting from the sequence of heating and addition steps described hereinabove, was then homogenized in a Gaulin homogenizer at a pressure of 5,000 psig. After homogenization, the final reduced cream cheese product was transferred through a vacuum deaerator and was filled into suitable size packages. The resulting final reduced fat cream cheese product had a fat level of about 1.25% and had the characteristics, mouthfeel and organoleptic

properties of a cream cheese product that contains a substantial level of fat.

The total butterfat contributed by the conventional high fat cream cheese was 0.68%. The resulting reduced fat cream cheese product had a distinctly improved flavor compared to a no-fat cream cheese, but which lacked the small amount of full-fat cream cheese.

Example 2

In another embodiment of the invention, the method of U.S. Patent No. 5,180,604 is used to produce an initial reduced fat cream cheese. In the method, skim milk is subjected to ultrafiltration treatment to provide a skim milk retentate having 26% solids. The skim milk retentate comprises 4.2% lactose, 19% protein, 2.05% ash, 0.24% fat and 0.12% salt. The skim milk retentate is subjected to high temperature, short time heat treatment to pasteurize the retentate. The retentate is then introduced into a fermentation tank and an *S. lactis* culture is added thereto along with 0.1% salt. The skim milk retentate (4000 gallons) is subjected to fermentation at a temperature of 78° F. for 16 hours. 1900 pounds of the fermented skim milk retentate is then introduced into a first mixer. The first mixer is a Groen kettle. Dry curd cottage cheese, at a level of 2086 pounds is added to first mixer 13 and 50 pounds of sodium citrate are also added. The agitating means of first mixer is turned on and the mixture is pumped through the first recirculating loop. Steam injection is commenced and the mixture of fermented retentate cottage cheese curd and sodium citrate are heated to a temperature of 145° F. Such heating takes place over a period of 15 to 30 minutes.

After being heated to a temperature of 145° F., the mixture is transferred to a second mixer, which is a Breddo mixer, and 27.5 pounds of xanthan gum

are introduced into the heated mixture while the mixture is being agitated. The mixture is retained under agitating conditions in the Breddo mixer for a period of 5 minutes after addition of the xanthan gum. The mixture is then transferred to a surge tank 31 and is then homogenized at a pressure of 2500 psig in a Gaulin homogenizer.

The mixture is transferred to a third mixer, which is a Pfaudler mixer. Corn syrup solids having a DE of 24 at a level of 7.4%, salt at a level of 1.1%, sugar at a level of 0.6%, artificial color at a level of 0.001%, carrageenan at a level of 0.15%, guar at a level of 0.1%, sorbic acid at a level of 0.1%, Vitamin A and oleoresin paprika are added in the third mixer. The mixture has a pH of 5.0. The mixture is agitated and recirculated in third mixer 37 as it is being heated to a temperature of 170° F.

Conventional high fat cream cheese, having a butterfat level of 34% is added to the initial reduced fat cream cheese in the third mixer when the temperature is 185° F. to produce a final cream cheese product. The conventional high fat cream cheese is added at a level of 3% of the total mixture to provide a final reduced fat cream cheese product having a total fat content of 1.3%. The mixture from the third mixer is then homogenized in a second Gaulin homogenizer at a pressure of 5,000 psig. The homogenized mixture is then passed through a Versator™ deaerator manufactured by Cornell Machine Co., maintained at a pressure of -26 in. Hg. During passage through the deaerator, the mixture cools to a temperature of 165° F.

The final reduced fat cream cheese product obtained after deaeration is then packaged and cooled. After cooling, the reduced fat cream cheese type product of the invention has the appearance, taste, consistency and texture of conventional high fat cream cheese.

Example 3

The procedure of Example 1 was repeated except that 9.2 pounds (0.5%) of high fat cream cheese powder was used to replace the high fat cream cheese. The flavor was similar to that of the reduced fat cream cheese of Example 1 which contained the high fat cream cheese.

Example 4

A reduced fat cream cheese was prepared in accordance with Example 1 except that no dairy flavor was added. The reduced fat cream cheese had an improved flavor as compared to a reduced fat cream cheese analog containing no high fat cream cheese.

Example 5

A reduced fat cream cheese was prepared in accordance with Example 1 having the following ingredients at the indicated levels:

| Ingredient | Weight-lbs. |
|---|---|
| Fermented skim milk retentate | 1614.7 |
| NFDM | 107.4 |
| High fat cream cheese (34% butterfat) | 60.8 |
| Tripolyphosphate salt | 18.8 |
| Salt | 7.3 |
| Sugar | 17.0 |
| Titanium dioxide | 6.1 |
| Carrageenan | 3.2 |
| Xanthan gum | 9.9 |
| Dairy Flavor | 2.0 |
| Preservatives and colorant | 2.6 |

This example illustrates that a simplified formulation can be used to prepare a reduced fat cream cheese in accordance with the invention which has an improved flavor as compared to a reduced fat cream cheese analog which does not contain a cream cheese flavor source.

Example 6

Reduced Fat Viscous Dressings

of the Mayonnaise or Salad Dressing Type

A high fat viscous dressing of mayonnaise or salad dressing type was made by a standard procedure. In a typical procedure for making viscous dressings of mayonnaise or salad dressing type; eggs, water, preservatives, sugar, salt, spices and flavors are mixed in a Hobart blender and soybean oil is added to form a coarse high fat viscous dressing. This is next passed through a high shear device such as a colloid mill or other high shear device to provide a uniform high fat viscous dressing product. This may be used as is (mayonnaise type) or mixed with a starch base (salad dressing).

High Fat Viscous Dressing with and without Starch Base

| Ingredients | Wt. % (6a) | Wt. % (6b) |
|---|---|---|
| Water | 8.78 | 5.53 |
| Eggs/Spices/Flavors/ Preservatives | 7.58 | 5.01 |
| Sugar/Salt | 1.22 | 9.65 |
| Soybean Oil | 80.0 | 46.8 |
| 120 Grain Vinegar | 2.50 | 8.45 |
| Starch Base | --- | 24.56 |

The high fat viscous dressing product is blended with additional flavorants/spices and added as a flavor source to the reduced fat viscous type dressing.

The reduced fat salad dressing can be prepared as shown in U.S. Patent 5,011,701 to Baer, et al. The reduced fat viscous dressing of the salad dressing type are prepared using microreticulated microcrystalline cellulose, as described in the Baer, et al. patent. In preparing the reduced fat viscous dressings, a starch base and a premix containing the high fat emulsion flavor product are combined.

The starch base is prepared from the following components:

| Ingredients | Wt. % (6a) | Wt. % (6b) |
|---|---|---|
| Water | 79.5306 | 79.5306 |
| Sugar | 8.6957 | 8.6957 |
| Starch | 8.0435 | 8.0435 |
| Vinegar 120 gr & lactic acid (50%) | 3.7303 | 3.7303 |
| Usage in Final High Fat Salad Dressing Product | 46% | 44% |

For all starch bases used in the examples, the starch base water is added to a jacketed vessel with sweep type agitator under agitation. The remaining ingredients were added under agitation to provide a slurry. The slurry is heated to a temperature of 190° F. and held for 1 minute. The slurry is cooled prior to use.

The reduced fat viscous dressing pre-mix is prepared as follows with composition as shown in the table below:

Reduced Fat Viscous Dressing Pre-Mix

| Ingredients | Wt. % (6a) | Wt. % (6b) |
|---|---|---|
| Water | 77.9555 | 53.6314 |
| Salt + Sucrose | 3.544 | 14.2989 |
| Xanthan | 0.9259 | 0.7081 |
| Vinegar 120 grain | 1.3301 | 4.0892 |
| Natural & Artificial Color | 0.0195 | 0.0372 |
| Corn Syrup 42 DE | 4.444 | 12.6453 |
| Flavor[1], including high fat viscous dressing, spices, vitamins & preservatives | 0.2944 | 0.9419 |
| MRC[2] solid | 3.00 | 2.87 |

[1] high fat viscous dressing usage level
(6a) 3.25%
(6b) 5.15%
[2] MRC = microreticulated microcrystalline cellulose

The reduced fat viscous dressing pre-mix was prepared by the following method. Water is added to a mixing vessel under agitation followed by vinegar, sugar, spices, colors, followed by MRC, high fat viscous dressing, preservatives, vitamins, salt and xanthan until well dispersed and homogeneous. The homogeneous pre-mix is passed through a high shear device. The finished reduced fat salad dressing products are made by combining the appropriate reduced fat dressing pre-mix and starch base at levels of 54 or 56 weight percent of reduced fat viscous dressing pre-mix and 46 or 44 weight percent starch base and mixing to provide a homogeneous blend. The product has texture and flavor which is closer to a higher fat product.

Example 7

Two high fat emulsion products with high flavor levels having compositions as shown in the table below are prepared in a Hobart blender, to which water, eggs (can be whole eggs, egg yolks, egg whites, salted or unsalted, liquid or dried, reduced cholesterol, enzyme treated, individually used or in combinations), spices,

flavors are added and mixed at speed 3. Soybean oil is added slowly to form an oil-in-water emulsion. Vinegar is added last and the mixture stirred for 1 minute. The high fat emulsion flavor can be used as is or can be subjected to shear to get desired droplet size which can vary from <1$\mu$ to >40$\mu$. The shear device can be a Scott Turbine mixer, Gaulin homogenizer, Rannie homogenizer, high shear short time pump, colloid mill, centrifical pump, etc.

| Ingredients | Wt. % (7a) | Wt. % (7b) |
|---|---|---|
| Water | 6.772 | 5.8037 |
| Salt + Sucrose | 3.544 | 14.2989 |
| Vinegar 120 grain | 2.932 | 2.933 |
| Oil | 60.467 | 60.467 |
| Eggs, Spices, Flavor, Preservatives | 29.711 | 30.677 |

The high fat emulsion flavor can be used as is (mayonnaise type) or combined with a starch base (salad dressing type). A starch base comprised of the following ingredients was prepared similar to that described previously in Example 6.

| Ingredients | Wt. % (7a) |
|---|---|
| Water | 79.530 |
| Sugar/Spice blend | 8.696 |
| Flavor/Salt/Starch | 8.044 |
| Vinegar 120 gr & lactic acid (50%) | 3.730 |

The high fat emulsion flavor (7a) from above is blended with the starch base (7a) with low shear mixing (high fat emulsion 81.350% and starch base 18.650%). The finished high fat emulsion flavor products are next incorporated into the reduced fat viscous dressing as described in Example 6, except that the reduced fat viscous dressing has the compositions shown below:

Reduced Fat Product Premix

| Ingredients | Wt. % (7a) | Wt. % (7b) |
|---|---|---|
| Water | 81.011 | 82.6777 |

| | | |
|---|---|---|
| Salt + Sucrose | 3.5444 | 3.5444 |
| Xanthan | 0.9259 | 0.9259 |
| Vinegar 120 grain | 1.2279 | 1.2279 |
| Natural & Artificial Color | 0.0347 | 0.0347 |
| Flavor[1], spices, vitamins & preservatives | 10.2565 | 8.5898 |
| MRC[2] solid | 3.00 | 3.00 |

[1] high fat emulsion flavor usage level
(7a) 5.1% high fat emulsion
(7b) 4.2% high fat emulsion
[2] MRC = microreticulated microcrystalline cellulose

The reduced fat viscous dressing pre-mix is then combined with a starch base having the composition of the table below. The viscous dressing pre-mix is used at a level of 54% and the starch base at a level of 46%.

Reduced Fat Viscous Dressing Starch Base

| Ingredients | Wt. % (7a) | Wt. % (7b) |
|---|---|---|
| Water | 75.1500 | 74.6904 |
| Sugar | 13.0762 | 13.0762 |
| Starch | 8.0435 | 8.5031 |
| Vinegar 120 grain & Lactic acid (50%) | 3.7303 | 3.7303 |

Sensory evaluation was performed on the above two reduced fat viscous dressings to study the impact of addition of a high fat emulsion, highly flavored counterpart as compared to the use of the flavor ingredients added directly. The trained panel evaluation indicated that the presence of a high fat emulsion flavor significantly enhances the oil intensity, eggy note and reduction of fruity off-note. Also, in a control sample which did not contain a high fat emulsion counterpart, a sulfury objectionable egg note was perceived. Further, light microscopy was performed on the samples containing the high fat viscous dressing emulsion counterpart and no change in droplet size over time was noted. Thus, the high fat emulsion flavor counterpart functions as a carrier and a source of flavor.

Example 8

Two high fat emulsion flavor counterparts were prepared similar to Example 7 except that the composition of the ingredients were as shown in the table below.

| Ingredients | Wt. % (8a) | Wt. % (8b) |
|---|---|---|
| Water | 17.1680 | 25.6700 |
| Salt + Sucrose | 2.6230 | 3.7000 |
| Amino Acid (Cysteine) | 0.0000 | 0.0400 |
| Vinegar 120 grain | 8.2000 | 7.0000 |
| Oil | 57.5500 | 46.0400 |
| Eggs, Flavor, Spices Preservatives | 14.4400 | 17.5500 |

A starch base was prepared as described in Example 6 with the following components.

| Ingredients | Wt. % (8a) |
|---|---|
| Water | 50.56 |
| Sugar/Spices/Eggs Flavor | 42.5 |
| Amino Acid (cysteine) | 0.20 |
| Starch | 4.00 |
| Vinegar 120 grain & lactic acid (50%) | 2.74 |

The high fat emulsion flavor (8a) is mixed with the starch base at a level of 80% high fat emulsion flavor to 20% starch base. The high fat emulsion flavor products are then added to a reduced fat viscous dressing at an appropriate level as shown in the table below.

Reduced Fat Viscous Dressing Premix

| Ingredients | Wt. % (8a) | Wt. % (8b) |
|---|---|---|
| Water | 69.5083 | 69.8790 |
| Salt + Sucrose | 13.4600 | 13.4600 |
| Xanthan | 0.7081 | 0.7081 |
| Vinegar 120 grain | 1.9618 | 1.9618 |
| Natural & Artificial Color | 0.0377 | 0.0372 |
| Flavor[1], spices, vitamins & preservatives | 11.4659 | 11.4659 |
| MRC[2] solid | 2.8670 | 2.8670 |

[1] high fat viscous dressing usage level (8a) 5.6% high fat emulsion flavor

(8b) 5.2% high fat emulsion flavor
2 MRC = microreticulated microcrystalline cellulose

The reduced fat viscous dressing pre-mix is then combined with a starch base having the composition of the table below. The viscous dressing pre-mix is used at a level of 54% and the starch base at a level of 46%.

Reduced Fat Viscous Dressing Starch Base

| Ingredients | Wt. % (8a) | Wt. % (8b) |
|---|---|---|
| Water | 75.1500 | 74.6904 |
| Sugar | 13.0762 | 13.0762 |
| Starch | 8.0435 | 8.5031 |
| Vinegar 120 grain & Lactic acid (50%) | 3.7303 | 3.7303 |

Sensory evaluation of the reduced fat salad dressing exhibited an enhancement in egg note and rounding of the other flavors. The heating of the cysteine and other ingredients within the high fat emulsion flavor starch base or pre-mix results in producing in-situ desired flavor character, i.e., more intense egg note and rounding of the other flavors resulting in a superior tasting reduced fat salad dressing, moving it closer to a high fat salad dressing. Thus, the high fat emulsion flavor counterpart can function as a source of flavor, a carrier of flavor and a generator of flavor to be used at appropriate levels in the reduced fat salad dressing.

Example 9

Pourable buttermilk type dressings were prepared utilizing a microreticulated microcrystalline cellulose dispersion as described in U.S. Patent No. 5,011,701 to Baer, et al. which included addition of a high fat emulsion counterpart to improve the taste. The high fat emulsion counterpart was prepared using the following compositions:

| Ingredients | Wt.%(9a) | Wt.%(9b) | Wt.%(9c) | Wt.% (9d) |
|---|---|---|---|---|
| Water | 7.7846 | 23.9839 | 22.0420 | 35.2770 |
| Buttermilk (cultured low fat) | 16.5432 | | | |
| Salt | | 4.1848 | 10.0000 | 5.0000 |
| Vinegar 120 grain | 1.8652 | | | |
| Xanthan | 0.3309 | | | |
| Oil | 69.4109 | 20.0535 | 18.0000 | 20.0000 |
| Eggs/Spices/Flavors | 3.7046 | 51.3694 | 37.6640 | 29.1600 |
| Stabilizer/Acidifier | 0.3606 | 0.4084 | 12.2940 | 10.5670 |
| Usage in the Final Reduced Fat Product | 1.6500 | 2.9870 | 2.5000 | 2.5000 |

The high fat emulsion counterparts were prepared as follows. To a mix tank, add water, cooked buttermilk slurry (when used), flavor, stabilizer and eggs. Mix and then add xanthan gum (when used) mixed with part of the soybean oil to the mixture. Add remaining soybean oil. After all the soybean oil has been added, add vinegar. The coarse oil-in-water emulsion is either used as is or is passed through a high shear device to form a fine oil-in-water high fat emulsion flavor. This is now added to the reduced fat pourable dressing as one of the flavors. Reduced fat pourable dressings were prepared with the compositions shown below.

| Ingredients | Wt. % (9a) | Wt.% (9b-9d) |
|---|---|---|
| 25 DE Corn Syrup | 31.5000 | 32.4460 |
| MRC (solids) | 2.3590 | 2.1400 |
| Vinegar 120 grain | 3.9464 | 1.9283 |
| Sugar (sucrose) | 2.6154 | 1.0767 |
| Salt | 2.1200 | 2.1218 |
| Xanthan Gum | 0.4600 | 0.4740 |
| Stabilizer/Acidifier | 2.0321 | 2.0336 |
| Flavors[1]/Spices/Colorants | 6.1905 | 5.8612 |
| Water | 31.7843 | 29.1984 |
| Buttermilk (cultured low fat) | 17.0923 | 22.7200 |

[1] including high fat emulsion flavor at levels indicated in previous table

In preparing the reduced fat buttermilk type pourable dressing product, buttermilk slurry, dry and liquid ingredients are added under high speed mixing and allowed to mix. This includes sugar, salt, xanthan gum, stabilizer, acidifier, flavors (including high fat emulsion counterpart), spices, colorants and corn syrup. This mixture is blended with MRC under high shear conditions. The resulting reduced fat buttermilk type pourable dressing exhibits a flavor profile closer to the high fat buttermilk type dressing, i.e., they have a well rounded, creamy attribute, making them taste closer to a high fat pourable dressing.

Example 10

A reduced fat thousand island dressing with a high fat emulsion counterpart was prepared in the same manner as the buttermilk pourable dressing of Example 9. The thousand island dressing has the following composition for a high fat emulsion counterpart and the finished product.

High Fat Emulsion Counterpart

| Ingredients | Wt. % |
|---|---|
| Water | 8.6000 |
| Eggs/Spices/flavors | 41.4000 |
| Oil | 50.0000 |
| Usage in the final reduced fat product | 1.8182 |

Reduced Fat Thousand Island Pourable Dressing

| Ingredients | Wt. % |
|---|---|
| Water | 56.3028 |
| Low DE Corn Syrup | 13.1500 |
| Sugar | 8.0590 |
| Vinegar 120 grain | 4.3896 |
| Tomato Paste | 6.0000 |
| Relish | 4.5000 |
| MRC (solids) | 2.4360 |
| Flavors[1]/Spices/ Colorants | 2.0770 |
| Salt | 1.8041 |

| | |
|---|---|
| Xanthan Gum | 0.3700 |
| Stabilizers/Acidifiers | 0.9114 |

[1] including high fat emulsion flavor as indicated in table above

The reduced fat thousand island pourable dressing with high fat emulsion flavor was perceived as more eggier and had a little more raisin character than the prototype with exactly the same formula but without use of a high fat emulsion flavor.

Example 11

A reduced fat frozen whipped topping was prepared using the following formulation and process.

A flavor concentrated high fat emulsion counterpart of the reduced fat frozen topping having the following composition was prepared (System A):

| Ingredients | Wt. % |
|---|---|
| Water | 20.11 |
| Hydrogenated Coconut and Palm Kernel Oil (50:50) | 50.25 |
| Emulsifying agents | 1.95 |
| Sodium caseinate | 5.02 |
| Flavors | 22.67 |

Reduced Fat Frozen Whipped Topping

| Ingredients | Wt. % |
|---|---|
| System A | 1.33 |
| Water | 48.019 |
| Hydrogenated Coconut and Palm Kernel Oil (50:50) | 4.46 |
| Emulsifying agents | 0.15 |
| Sodium caseinate | 0.39 |
| Corn Syrup 42 DE 80% solids | 41.06 |
| High Fructose Corn Syrup | 3.00 |
| Polysaccharide gums | 0.23 |
| Colors | 0.004 |
| Sodium bicarbonate | 0.007 |
| Starch | 1.35 |

A flavor concentrated version of an emulsion preblend of the high fat counterpart of the reduced fat frozen topping was prepared as follows. The water,

flavors and water soluble emulsifying agents were first blended in a Hobart blender. The oil soluble emulsifier and the sodium caseinate were mixed with an aliquot of the melted hydrogenated coconut/palm kernel oil and immediately added to the Hobart blender. The rest of the melted hydrogenated coconut palm kernel oil was then added to the Hobart blender under brisk agitation.

In the meantime, the unflavored reduced frozen whipped topping was prepared as follows. The water, hydrogenated coconut/palm kernel oil, emulsifying agents, sodium caseinate, colors, soluble carbohydrates, polysaccharide gums and sodium bicarbonate were batch stirred and submitted to pasteurization (160° - 165° F. for 15 minutes).

Five minutes before the end of the pasteurization, the flavor concentrated high fat emulsion counterpart was added to the reduced fat emulsion preblend. After pasteurization, the mixture was passed through a two-stage homogenizer (8,000 psig first stage and 500-600 psig second stage).

A starch base containing 4% modified waxy maize starch, 40% corn syrup and 56% water was prepared and held at 190° - 195° F. for 10 minutes, cooled to 40° F. and combined with the homogenized emulsion mixture to provide a reduced fat frozen topping product. Two parts of the emulsion mixture were used per one part of the starch base. The total formulation was cooled to 40° F. and held in a stirred aging tank at 40° - 44° F. for 60 minutes.

The aged emulsion was then fed to a continuous recycle mixer (1000 rpm) where sufficient air was introduced to produce an overrun of about 291% in the reduced fat whipped topping product. The pressure out of the mixer was about 63 psig. The product was then fed to a series of two, cooled, scraped-surface heat exchangers at a flow rate of about 4 pounds per minute where it was

whipped and from which it exited at a temperature of about 58° F. The pressure of the whipped emulsion was reduced to atmospheric pressure by passage through a piping system which is insulated to maintain product temperature. The product was then put in containers and frozen to a temperature of 0° F.

The product was judged to be freeze-thaw stable and the thawed product was judged to have higher flavor intensity and be an improved product compared to a control reduced fat whipped topping of the same formulation but without the high fat emulsion counterpart.

Example 12

A reduced fat process cheese product was prepared in accordance with the method of U.S. Patent No. 5,215,778 to Davison, et al., with skim milk cheese and the composition shown below. The skim milk cheese was blended with the aqueous MRC, the various dry components and wet mix components (with exception of water condensate which is added during cooking) using the composition shown in the table hereinbelow. A natural high fat long hold (six months) cheddar cheese which had been ground, was added and mixed with colors and flavors in the blender for approximately 1 minute. Add one half of the cheese blend and emulsifying salts to the cooker. Turn on steam (60 psi) and auger motor (setting approximately 0.4, 140 rpm). Heat to 164° F. Turn off steam and add remaining cheese blend. Heat to 205° F. Turn off steam and recirculate. Hold product for 3 minutes. Transfer to the hot pack filler and package.

Reduced Fat Process Cheese Product

| Ingredients | Control w/o high fat cheese Wt. % (a) | Product with high fat cheese* Wt. % (b) |
|---|---|---|
| Skim milk cheese | 55.610 | 54.730 |
| Microreticulated cellulose | | |

| | | |
|---|---|---|
| slurry | 5.000 | 5.000 |
| Nonfat dry milk | 4.546 | 4.546 |
| Dried whey | 5.682 | 5.682 |
| 24 DE Corn syrup | 3.409 | 3.409 |
| Buttermilk powder | 1.137 | 1.137 |
| Sodium chloride | 0.750 | 0.750 |
| Sodium citrate | 0.392 | 0.392 |
| Flavors*/Vitamin | 3.770 | 4.291 |
| Sorbic acid | 0.200 | 0.200 |
| Titanium dioxide | 0.140 | 0.140 |
| Carrageenan | 0.170 | 0.170 |
| Carboxymethyl cellulose | 0.170 | 0.170 |
| Water | 10.524 | 10.883 |
| Water condensate (net) | 8.500 | 8.500 |
| | 100.00 | 100.00 |

* high fat natural long hold cheddar cheese usage 1.26%

Two cheese slice products which contained less than 1.67 weight percent fat based on the total weight of the processed cheese product were prepared [(a) control with no high fat natural aged cheddar cheese, (b) experimental containing high fat natural aged cheddar cheese]. Sensory evaluation was performed on the control and experimental samples with a trained panel. The panel data showed that the experimental process cheese product was superior having less off-flavors and bitterness while maintaining the cheese flavor.

Sensory data of reduced fat cheese slices with and without high fat natural aged cheddar cheese.

| Attributes | Reduced fat cheese with high fat cheese | Reduced fat cheese without high fat cheese |
|---|---|---|
| off-flavor | 2.82 | 4.09 |
| cheese flavor | 2.91 | 2.55 |

The off flavor evaluation difference was statistically very significant. The cheese flavor evaluation difference was not statistically significant.

Example 13

Reduced Fat Natural Cheese

A reduced fat cheddar-type natural skim curd cheese was prepared by introducing 37.48 pounds of pasteurized skim milk (0.06% butterfat, 9.5% total solids) and 16 grams butterfat into a cheese vat and heating to 88° F. (31.1° C.). An amount of a mesophilic lactic acid starter culture was added to the milk substrate sufficient to cause the pH of the milk to drop to 61.66 after about 60 minutes at 88° F. (31.1° C.).

The acidified milk was coagulated by the addition of rennet (0.2 to 0.4 ounces of single strength rennet per 100 pounds of milk) to obtain a firm coagulum. The coagulum was then cut and the mixture of curds and whey was cooked to a temperature of 102° F. (38.9° C.) in 30 minutes.

When the pH of the curd reached 5.7 to 6.1, (total acidity measured as lactic acid of 0.13% to 0.18%), the whey was separated from the curd and the curd was washed with 40° F. (4.4° C.) water for 10 minutes. The pH of the washed curd was 5.75.

Salt at a level of 36 g was evenly sprinkled over the surface of the cheese and the cheese was packaged in accordance with conventional practices and stored at 40° F. (4.4° C.).

A second batch of cheese was prepared in an identical fashion except the butterfat was omitted and instead 57.6 g of ground conventional cheddar cheese (34% fat, 25% protein, 35.5% moisture, 64.5% total solids) was sprinkled evenly over the surface of the curd along with the salts.

The two no fat natural cheeses had the following overall composition.

Samples of the two lots were presented to a panel for organoleptic evaluation. The sample containing higher fat conventional cheddar cheese in place of the

butterfat was found to have a better overall flavor and a reduction in perceived off flavors.

**WHAT IS CLAIMED IS:**

1. A method for producing a reduced fat food product which has a high fat emulsion counterpart comprising providing an initial reduced fat food product with less fat than is desired in the final reduced fat food product and combining the initial reduced fat food product with an effective amount of a high fat emulsion counterpart so as to provide a final reduced fat food product with improved flavor.

2. A method in accordance with Claim 1 wherein said initial reduced fat food product has from 0% to about 5.5% fat.

3. A method in accordance with Claim 1 wherein said high fat emulsion counterpart has from about 20% to about 80% of fat.

4. A method in accordance with Claim 3 wherein said high fat emulsion counterpart is present in said final reduced fat food product at a level of from about 0.625% to about 30%.

5. A method in accordance with Claim 1 wherein said final reduced fat food product has from about 0.5% to about 6.0% fat.

6. A method in accordance with Claim 1 wherein the fat in both the initial reduced fat food product and the high fat emulsion counterpart is selected from the group consisting of soybean oil, hydrogenated soybean oil, corn oil, cottonseed oil, palm kernel oil, coconut oil, cocoa butter, olive oil, rape seed oil, sunflower oil, neobee oil, butterfat, butterfat fractions and mixtures thereof.

7. A method in accordance with Claim 1 wherein said high fat emulsion counterpart has an enhanced level of flavor as compared to the conventional high fat emulsion counterpart.

8. A method in accordance with Claim 1 wherein said enhanced flavor level is sufficient to make said high fat emulsion counterpart unpalatable when consumed on an as-is basis.

9. A method in accordance with Claim 1 wherein said final reduced fat food product is cream cheese.

10. A method in accordance with Claim 1 wherein said final reduced fat food product is a viscous dressing of the mayonnaise or salad dressing type.

11. A method in accordance with Claim 1 wherein said final reduced fat food product is a pourable dressing.

12. A method in accordance with Claim 1 wherein said final reduced fat food product is process cheese or natural cheese.

13. A method in accordance with Claim 1 wherein said final fat reduced food product is a dairy or non-dairy dessert topping.

14. A method in accordance with Claim 1 wherein said final reduced fat food product is a coffee whitener.

15. A method in accordance with Claim 1 wherein said high fat emulsion counterpart has a lower

level of flavor as compared to a conventional high fat emulsion counterpart.

16. A method in accordance with Claim 1 wherein said final reduced fat food product is a pudding.

17. A method in accordance with Claim 1 wherein said high fat emulsion contains a sulfur containing amino acid and said final reduced fat food product is heated to a temperature in the range of from about 110° F. to about 190° F.

18. A reduced fat food product which has a full-fat emulsion counterpart comprising an initial reduced fat food product having less than the level of fat desired in a final reduced fat food product which is combined with an effective amount of a high fat emulsion counterpart to provide a final reduced fat food product with improved flavor.

19. A reduced fat food product in accordance with Claim 18 wherein said initial reduced fat food product has from 0% to about 5.5% of fat.

20. A reduced fat food product in accordance with Claim 18 wherein said high fat emulsion counterpart has from about 20% to about 80% of fat.

21. A reduced fat food product in accordance with Claim 20 wherein said high fat emulsion counterpart is present in said final reduced fat food product at a level of from about 0.625% to about 30% of fat.

22. A reduced fat food product in accordance with Claim 18 wherein said final reduced fat food product has from about 0.5% to about 6.0% fat.

23. A reduced fat food product in accordance with Claim 18 wherein said full-fat emulsion counterpart has an enhanced level of flavor as compared to a normal full-fat emulsion counterpart.

24. A reduced fat food product in accordance with Claim 23 wherein said enhanced level of flavor is sufficient to make said high fat emulsion counterpart unpalatable when consumed on an as-is basis.

25. A reduced fat food product in accordance with Claim 18 wherein said high fat emulsion counterpart has a lower level of flavor as compared to a normal full-fat emulsion counterpart.

26. A reduced fat food product in accordance with Claim 18 wherein said high fat emulsion counterpart has the same level of flavor as compared to a normal full-fat emulsion counterpart.

27. A reduced fat food product in accordance with Claim 18 wherein said food product is cream cheese.

28. A reduced fat food product in accordance with Claim 18 wherein said food product is a viscous dressing of the mayonnaise type.

29. A reduced fat food product in accordance with Claim 18 wherein said food product is a pourable dressing.

30. A reduced fat food product in accordance with Claim 18 wherein said food product is process cheese or natural cheese.

31. A reduced fat food product in accordance with Claim 18 wherein said food product is a dairy or non-dairy dessert topping.

32. A reduced fat food product in accordance with Claim 18 wherein said food product is a coffee whitener.

33. A reduced fat food product in accordance with Claim 18 wherein said final reduced fat food product is a pudding.