

SIMPLESSE®: ALL NATURAL FAT SUBSTITUTE

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Introduction

Today you have heard other speakers describe some novel ways, such as biotechnology in animals, to decrease fat in our diet. Now, I am going to describe how The NutraSweet Company has chosen a markedly different approach of replacing fat in the diet with the first all natural fat substitute called Simplese®.

The current recommendations by health organizations (1,2) that a reduction in the amount of fat intake, especially saturated fat, will decrease the risk of certain diseases is problematic for the consumer who is unwilling to give up the creamy rich taste associated with fat rich foods. On the one hand, the consumer is much more knowledgeable of health risk associated with excess fat and calorie intake, while on the other hand, is unwilling to change dietary habits by sacrificing the pleasure of eating foods with a creamy rich taste associated with fat.

The availability of good-tasting low calorie, low fat foods may help individuals adhere to a healthier life style. This recommendation is not easy to comply with if there is no replacement for the traditional calorie/fat rich foods that our society is so accustomed to enjoying. The food industry has been challenged to develop new food products that maintain excellent taste qualities while reducing the calories and fat present in traditional products. The NutraSweet Company recently introduced the first all natural fat substitute which may help consumers better adhere to current dietary guidelines suggested by leading health organizations.

Simplese® will provide consumers with great tasting foods that are greatly reduced in fat, lower in calories, and lower in cholesterol than their fat-laden counterparts.

Simplese® Principle

Simplese® is based on the principle that there is a perceptual threshold in the mouth whereby particles with a certain size and shape are not perceived as individual particles but rather as a creamy fluid. For example, particle size of less than 0.1 microns is perceived by the mouth as watery, whereas, particle size greater than 3 microns can be perceived by the mouth as powdery or gritty. Simplese® contains round protein microparticles, over 50 billion per teaspoon, in the range of 0.1 to 3 microns which are perceived by the mouth as a smooth, creamy texture normally characteristic of a fat.

Simplese® Process

The process used to produce Simplese® uses all natural ingredients and normal techniques commonly used in the food industry (3). Simplese® is primarily composed of proteins, and can be made from different proteins. The current product contains egg and milk proteins. The actual selection of protein source depends upon specific product application.

Simplese® uses other natural ingredients (such as water, pectin, sugar, and citric acid) as part of the ingredient used in a frozen dessert. The process of producing Simplese® involves mixing, blending, and cooking these natural ingredients using established food processing techniques (3). As protein is heated it forms a gel; however, if heated with severe agitation followed by rapid cooling, it forms tiny round protein particles that are within a certain size range. This unique process (see Figure 1) produces the all natural fat substitute,

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Simplese[®], with the same smooth, creamy taste and texture of a fat.

The formation of these tiny particles of protein present in Simplese[®] is called microparticulation of protein. Microparticulated protein is present in a broad range of sizes (.05 to 80 microns) in many common foods (Table 1).

For example, at the low end of the spectrum are casein micelles that are abundant and very small microparticulated protein found in dairy products such as milk, and at the upper end of the spectrum are the larger microparticulated protein found in vegetable proteins such as soy.

Although microparticulated protein is common in other foods, what is unique in Simplese[®] is that it is consistently a certain size and shape. This enables these microparticles of protein to provide the taste and texture of a fat.

Simplese[®] Applications

Simplese[®] can be used as a fat replacement in a wide variety of products such as in oil-based products (salad dressings, mayonnaise, margarine) and dairy-based products (sour cream, dips, ice cream, yogurt, cheeses, and butter as a spread). Although Simplese[®] cannot be fried or baked due to the coagulation of the natural microparticulated protein, thus losing its creamy properties, it can be used on hot foods, such as sour cream added to a baked potato, or butter spread on toast.

The first application of Simplese[®] was to replace the 16% butterfat with Simplese[®] in a superpremium ice cream (see Figure 2). This produced a frozen dessert with comparable smooth rich taste and texture of the fat-laden counterpart, but with a significant reduction in fat, and with greatly reduced calories and cholesterol (see Table 2).

Another application (see Figure 3) is the reduction of fat and calories (see Table 3) in the salad dressing category by replacing the oil in these products. This usage of Simplese[®] may help consumers comply to a more nutritious diet by increasing consumption of whole grains and fresh vegetables.

Research Studies

The NutraSweet Company conducted an extensive review of the literature to document that the Simplese[®] process would not result in any changes to the natural ingredients that would not be expected from normal food processing techniques. The results of this review documented that microparticulated protein is found in many common foods (see Table 1) and that the process used to form Simplese[®] would not alter the identity or quality of the proteins.

One-dimensional and two-dimensional gel electrophoresis (4) were also performed on the Simplese[®] product to document that the identity of the proteins was not altered from the Simplese[®] process. Careful review of these electrophoretic profiles revealed the same proteins present in the premix (mixture prior to microparticulation) and the final Simplese[®] product. These tests specifically did not identify any new proteins from the Simplese[®] process.

The quality of the proteins present in Simplese[®] was also tested to assure that the process of microparticulation did not change the nutritional quality/digestibility of the proteins. Standard protein efficiency assays using rats (5) documented that the quality of the proteins was not altered by the Simplese[®] process. In addition, amino acid analysis (5) also documented that the Simplese[®] process did not change the amino acids profile from that expected when these proteins from egg and/or milk are cooked by conventional methods.

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Since the composition of Simplese® included proteins from milk and eggs it was expected that individuals allergic to egg and milk would be allergic to Simplese®. Nevertheless, in-vitro experiments were conducted on the plasma of individuals known to be allergic to egg and/or milk proteins to demonstrate that the Simplese® process did not alter the recognition of the proteins of these individuals (6,7). The results of these tests documented that those individuals known to be allergic to egg and/or milk protein also identified the proteins in Simplese® containing products. Therefore, individuals known to be allergic to egg and/or milk proteins will likely be allergic to Simplese® containing products.

Projected Consumption

The NutraSweet Company used Market Research Corporation of America Information Services to determine the projected consumption of Simplese®. The 90th percentile, 14 day average, eaters only, for all potential product categories was used to determine the consumption of Simplese® for all age groups. This would amount to approximately 38.2 grams of Simplese® per day, which is equal to approximately 7.6 grams of protein and 4.7 grams of microparticulated protein. This amount of total protein or of microparticulated protein contributed to the diet at the 90th percentile is approximately equal to the amount found in a cup (8 oz.) of milk. Therefore, the contribution of protein and microparticulated protein is insignificant of what is normally consumed from other dietary sources.

The review of this scientific data by the Food and Drug Administration (FDA) led to their conclusion that Simplese® was generally recognized as safe (GRAS), and on February 22, 1990, Simplese® was affirmed by the FDA as GRAS for use in frozen desserts.

Nutritional Impact

Products containing Simplese® can provide health professionals with an additional tool in counseling consumers on low-fat diets. Products with Simplese® will be greatly reduced in fat, while maintaining the rich, creamy texture associated with fat, and may help consumers adhere to recommended dietary objectives for fat, calories, and cholesterol.

The use of Simplese® can greatly reduce the fat and calories from a number of products as illustrated in Tables 4-6.

The use of Simplese® in all potential applications would reduce the average total fat intake by 15%, saturated fat by 16%, and cholesterol by 6%. The remaining fat intake in the diet (approximately 86%) is derived from sources (e.g. meats, baked goods, or frying oils) where Simplese® cannot be used. A reduction of fat by this magnitude in the average American diet would result in a decrease in fat intake from approximately 37% to 32% of total calories assuming that the diets remained isocaloric. This decrease in calories from fat approaches what is currently recommended by health organizations such as the American Heart Association as illustrated in Table 7.

Simple Pleasures® is the first product to be marketed using Simplese® all natural fat substitute, in place of butterfat, to make a natural frozen dessert. Simple Pleasures® is fat-free, has half of the calories, and is significantly reduced in cholesterol compared to superpremium ice cream. Table 8 lists the nutritional label information of Simple Pleasures®.

Conclusion

Simplese® is not a panacea in solving all of society's nutritional problems. However, Simplese® combined with

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a sensible diet, may help people achieve a healthy low fat life-style without sacrificing the enjoyment of great tasting foods.

References

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FIGURE I.

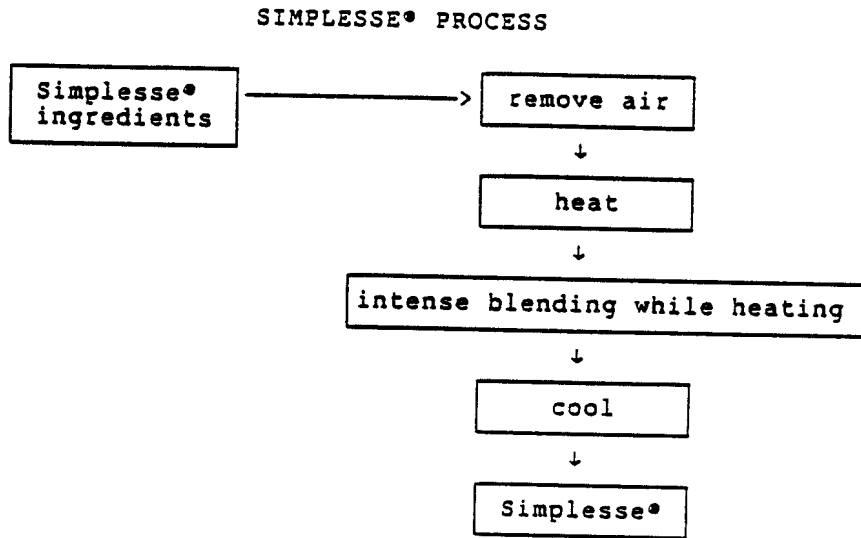
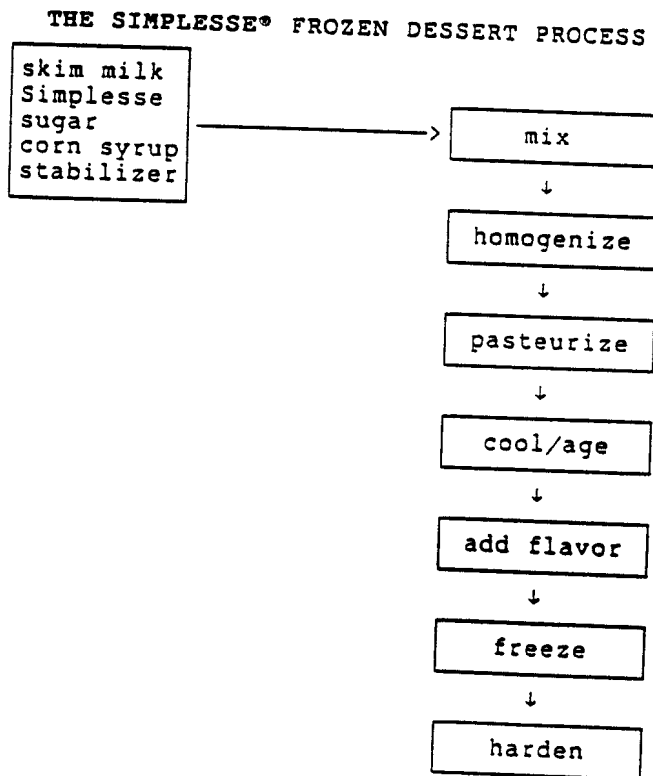


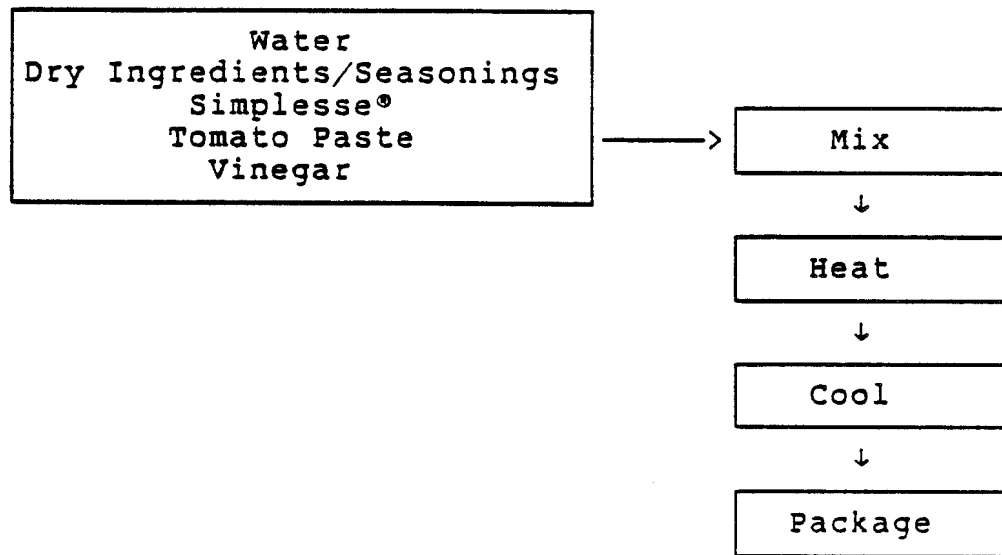
FIGURE II.



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FIGURE III.

THE SIMPLESSE® SALAD DRESSING PROCESS



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TABLE 1	
Protein microparticles are common in many foods	
milk pudding yogurt cheese	soy tofu egg white processed meat products

TABLE 2		
	Simple Pleasures* Strawberry Frozen Dairy Dessert (per 4 fl. oz.)	Super Premium Strawberry Ice Cream (per 4 fl. oz.)
Fat (g)	<1	15
Calories	120	250
Cholesterol (mg)	11	89
Carbohydrate (g)	22	23
Protein (g)	8	5
Sodium (mg)	55	40
Calcium (mg)	129	100

TABLE 3		
Nutrient Comparison of Salad Dressing		
	Creamy French Dressing prototype with Simplese* (per tablespoon)	Commercial French Dressing (per tablespoon)
Fat (g)	<1	6
Calories	23	67
Cholesterol (mg)	0	9
Carbohydrate (g)	5	3
Protein (g)	Trace	Trace
Sodium (mg)	185	214

TABLE 4			
ROLE OF SIMPLESSE® IN FAT REDUCTION			
	Traditional product (Grams of Fat)	Simplesse® product (Grams of Fat)	Fat reduction (percent)
Salad dressing (1 tablespoon)	6	<1	92%
Mayonnaise (1 tablespoon)	11	<1	95%
Ice Cream (4 ounces)	15	<1	97%
Sour Cream (1 tablespoon)	5	<1	90%

TABLE 5			
ROLE OF SIMPLESSE® IN CALORIE REDUCTION			
	Traditional product (Calories)	Simplesse® product (Calories)	Calorie reduction (percent)
Salad Dressing (1 tablespoon)	67	23	66%
Mayonnaise (1 tablespoon)	99	21	79%
Ice Cream (4 ounces)	250	120	52%
Sour Cream (1 tablespoon)	51	20	61%

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TABLE 6

ROLE OF SIMPLESSE® IN REDUCING CALORIES FROM FAT

	Traditional product (Calories from fat)	Simplesse® product (Calories from fat)	Calorie reduction (percent)
Salad Dressing (1 tablespoon)	54	<9	90%
Mayonnaise (1 tablespoon)	99	<9	95%
Ice Cream (4 ounces)	135	<9	97%
Sour Cream (1 tablespoon)	45	<9	90%

TABLE 7

DIETARY INTAKE IN THE UNITED STATES

PERCENT OF CALORIES

	Current diet	Recommended AHA diet	Simplesse® diet
Carbohydrate	48	54	52
Protein	16	16	17
Fat	37	30	32

TABLE 8

SIMPLE PLEASURES® NUTRITIONAL PROFILE

	FAT (gm)	Cal (Kcal)	PRO (gm)	CARB (gm)	CHOL (mg)
Toffee Crunch	1	130	9	22	10
Chocolate	1	140	9	25	10
Strawberry	1	120	8	22	10
Coffee	1	120	8	22	15
Peach	1	120	7	21	10
Rum Raisin	1	130	7	25	15