Imitation Dairy Products—Past, Present and Future[1]

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Abstract

The history of substitute dairy products and their impact on the market is reviewed. The present status of filled and imitation milk products is discussed from the flavor acceptance, economic, legal and nutritional standpoints. Comments on some factors which will affect the future growth potential of these products, such as Consumer acceptance, economics, proposed legislation with respect to compositional, nutritional and labeling requirements and industry attitude toward marketing of these products are given.

Substitute products or imitation products which simulate dairy products have been on the market for a long time. Even before the adoption of the Federal Filled Milk Act in 1923, products in which vegetable fat was substituted for milk fat in a skim milk base had already appeared on the market. While the Filled Milk Act made interstate commerce of simulation products of fluid milk and cream in liquid, frozen, concentrated and dried forms illegal, it did not prohibit their manufacture and sale in States in which it was legal. This law was upheld at the Supreme Court level in the Carolene Case and is still in effect today. However, filled evaporated milk has been sold in several states since that time; in Illinois it is still being promoted with billboard advertising which says "If cows could, they'd give Milnot."

Let us briefly review some of the history of imitation dairy products. We are aware of the history of margarine and the decline in the per capita consumption of butter over the past 25 years. In the past 10 years, butter consumption fell from 9.4 lb./capita annually to about 6 lb., while during the same period margarine consumption has increased from 8 to 10.5 lb./capita annually and the rate of increase in substitution seems to have increased somewhat during the past two years.

From 1953 to 1960 the sales of vegetable fat frozen desserts increased from about 23 million gallons per year to about 50 million gallons. Since 1960, sales have remained at approximately 50 million gallons per year which represents about 4.5% of the total ice cream and frozen dessert volume. However, in 9 of the 11 states in which it is manufactured, the production amounts to over 10% of the ice cream sales; in Texas it accounts for about 47% of the ice cream volume. Texas produces about half of the total mellorine produced in the United States and Illinois produces about 2 million gallons per year.

In more recent years (since the early sixties) we have seen the introduction of vegetable fat coffee whiteners in liquid, frozen and dried forms sold in various outlets—retail, institutional, coffee vending, etc.—vegetable fat whipped toppings, vegetable fat cultured products made in semblance of sour cream, vegetable fat dip bases, vegetable fat milk shakes, eggnogs and other products.

In the past 20 years, the per capita consumption of fluid cream declined from about 13 lb. annually to about 7 lb. in 1967. Vegetable fat coffee whiteners and whipped toppings replaced part of this market. Sales of dried coffee whiteners containing about 36% vegetable fat are estimated at about 100 million lb. annually and the sales of frozen coffee whiteners containing about 10% vegetable fat are also approximately 100 million lb. Thus, it is estimated that approximately 46 million lb. of vegetable fat are utilized annually in these products and that approximately 15–20% of the fluid cream market has been captured by these products in the last six or eight years (1).

The U.S. Department of Commerce in the 1963 Census of Manufactures, reported that in 1963, 53 million quarts out of a total of 66 million quarts of whipped topping were made from vegetable fat or about 80% of the total volume. In addition there is a considerable volume of dried toppings manufactured today which are estimated to be about 15 million lb. annually.

Reliable information on the impact of vegetable fat sour cream and dips is not readily available. Sour cream production is about 115 million lb. annually, and the vegetable fat sour cream and dip market may be somewhere in the neighborhood of 8–10% of this volume.

It would appear that practically all fat containing dairy products are now subject to simulation and it has been rather reliably estimated that about 25% of the dairy industry butterfat market has been replaced by the substitute products over the past 20 to 25 years.

Naturally the question is asked why imitation products have made such inroads in dairy product sales. Obviously economics has played a major role. With 50¢ difference in the price of butter and margarine, 25¢/pt. difference in whipping cream and whipped topping, 16–18¢/pt. difference in half and half and coffee whiteners, inroads on sales of dairy products can be expected if the quality of the substitutes is acceptable to consumers.

Then, too, in some instances the imitation products are more functional than the corresponding dairy products. Because of advancements in fat and oil technology, the flavor and stability of fats have been improved and fats can be tailor-made with respect to physical characteristics such as melting point and favorable solid fat indices to make the lipids systems more functional for certain specific applications.

Dried coffee whiteners can be formulated from nondairy ingredients which have considerably longer shelf life than the corresponding dried products made from milk, primarily because of the improved stability of the vegtable fat over milk fat toward oxidation. Likewise lipid systems in whipped toppings can be formulated to give improved whipping characteristics and stability of whip, and liquid coffee whiteners can be formulated with a freeze thaw stability which is not attained in the corresponding dairy products.

While it might be possible to improve the functionality of the corresponding dairy products, present standards in many cases forbid the addition of necessary materials. Imitation products up to now have not been subject to the same rigorous health regulations and legal restrictions in composition as are the dairy counterparts. The composition in fat, protein, carbohydrate, mineral, vitamin and calorie contents can be varied to suit the need as long as wholesome ingredients are used and as long as labeling is adequate and truthful.

More recently, attention has been directed toward the newest member of the imitation family, imitation milk. This product is recognized as having the largest market potential of all. The fluid milk business is a 6.5 billion dollar a year industry. The introduction of *imitation* milk on the market has created more flurry and controversy in the dairy industry than the introduction of any other substitute product since margarine.

At this point we should distinguish between the filled type of imitation milk (in which vegetable fat replaces milk fat in a skim milk base whose composition when vitamins A and D are added does not differ appreciably from milk) with the simulated milk made with vegetable fat, a protein source (sodium caseinate, soya protein, whey protein), a carbohydrate source (corn syrup solids, lactose),

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an emulsifier, buffer salts, stabilizer, added vitamins and flavoring.

Up to now the only reliable information on quantities of imitation milk produced relate to the filled variety. In the dozen or so states where it is legal, the sales seem to be increasing. In Arizona during the past 18 months sales have increased from about 2% of the total fluid milk sales to over 10% of the total fluid milk sales (July 1968). In California, the filled milk sales amount to about 1.1% of the fluid milk sales. The Milk Industry Foundation (1) made a study in March 1968 involving 62 supermarkets in 7 states, which showed that the sales of filled milk amounted to 7% of the total fluid milk sales. The sales of filled milk in a Central Illinois supermarket chain accounted for about 12% of fluid milk sales only eight months after introduction of the product. The current total sales of filled milk as estimated from Federal Milk Market reports (29 markets) are about 60–65 million lb. annually (2). This amount of filled milk would require approx. 2.3 million lb. of vegetable fat annually.

The future growth of these imitation milk products will depend on a number of factors, some of which are the famous three of Blue Bonnet fame—flavor, nutrition and economy. To these should be added legal aspects, and Industry's attitude toward the marketing of these products.

A survey made in July 1968 by the Dairy and Ice Cream Field indicated that of 474 companies only 10% are now marketing filled milk, while 58% would market if the law permitted. However, only 18% said they would be the first to introduce the product on the market.

While the flavor and nutritional aspects of filled milk appear favorable, there are legal barriers to interstate marketing, and its sale is currently prohibited in many States. The future growth of filled milk will depend on whether or not these barriers are removed. It will also depend upon future pricing policies for skim milk. Producers of milk are concerned about loss of income from the sale of filled and imitation milks and hearings conducted by USDA on Federal Milk Marketing order classified pricing policy for the skim milk and nonfat dry milk used in production of imitation milk.

The economic study conducted by the Milk Industry Foundation (1) predicted that if handlers pay Class I price for skim milk and a compensatory payment for nonfat dry milk to equalize the price differential between skim milk and nonfat dry milk, the sales of filled milk could be as much as 10% of the fluid milk sales in five years. If, on the other hand, the price of skim is lowered to handlers to about 90¢/cwt over manufactured milk prices, sales of filled milk could be as much as 21% of total milk sales in five years. These estimates would be conservative if laws restricting the sales of filled milk were removed.

Early this summer, we conducted a survey at the University of Illinois among users of filled milk in Champaign-Urbana and Decatur. Through facilities of survey research lab, customers of a filled milk product were interviewed in five Eisner's stores in Champaign-Urbana and two Eisner Stores in Decatur. At the time the survey was made, the filled milk sales amounted to about 10% of the total fluid sales in these stores and the product had been in the stores about six months. We interviewed purchasers representing 35% of the filled milk volume in these stores. Questions asked related to how long customers had been purchasing filled milk, the regularity of purchase, quantities purchased, how the product was used, something about the milk and filled milk drinking habits of adults, teenagers and children in these families, what dairy products the purchase of filled milk replace or partially replace, how the customers rated the flavor of the product and their feelings on nutritional advantages or disadvantages of the product vs. milk, reasons for purchase of filled milk, and the price they would be willing to pay for filled milk in relation to the price of milk. Information was also secured on family size and family income of the purchasers of filled milk. At the time of the survey, the price spread between filled milk and regular milk ranged from 9¢–15¢/½ gal cheaper for filled milk, depending on brand and store location. Two per cent milk was priced 4¢–7¢/½ gal higher than filled milk and skim milk was 2¢/½ gal lower in price than filled milk.

Briefly, the results indicated that

1. Ninety-five per cent of the customers of filled milk rated the flavor of the product good or excellent.
2. About 30% of the customers had been purchasing the filled milk product since its introduction on the market while 17% had been purchasing the product for less than two months. Three and a half per cent of those interviewed were purchasing the product for the first time; 86% were regular purchasers; and 14% occasional purchasers.
3. The average weekly per capita consumption in families who purchase filled milk was about one half gallon and there were no statistically significant differences in per capita consumption among income groups although there was a trend toward higher consumption in lower income groups.
4. Ninety-five per cent consumed filled milk as a beverage, 89% on cereals, 82% in cooking; 71% said that these three uses were the only ways it was used.
5. Milk and filled milk drinking habits of family members showed that 56% of the adults, 72% of the teenagers and 78% of the children drank filled milk regularly while 16% of the adults, 6% of the teenagers and 5% of the children never drank filled milk. In these same families 20% of the adults, 30% of the teenagers and 39% of the children regularly drank milk, while 49% of the adults, 44% of the teenagers and 37% of the children never drank milk.
6. Seventy-seven per cent of the subjects responded that filled milk replaces milk; 68%, 2% milk; 35%, skim milk; 29%, evaporated milk; 29%, nonfat dry milk.
7. Fourteen per cent of the families indicated that they now purchase more fluid milk products including filled milk than before the advent of filled milk; 3% said less; and 83% indicated about the same total amount.
8. About 25% thought that there was a nutritional advantage for filled milk over regular milk primarily because they thought there were less fat and more vitamins in filled milk. However, that the fat content of the filled milk was approximately the same as that of the milk and only Vitamins A and D were added to the filled milk at approximately the same levels as milk. Only 4% thought there was a nutritional disadvantage for filled milk over regular milk but reasons were not clear. Some said unnecessary ingredients were added and some gave no answer.
9. Reasons given for purchase: 78%, lower in cost; 43%, liked the flavor; 16%, not as much fat; 9%, same nutrition. Other minor reasons were, used as a supplement, does not spoil, and certain health reasons. Approximately the same percentage of people in different income levels listed price as main reason for purchase.
10. While it was interesting to note that price was the main reason for purchase of filled milk, when asked if they would continue to purchase filled milk if the price per half gallon were less than milk by 9¢, 98% said yes; by 6¢, 95% said yes; by 3¢, 78% said yes; by 1¢, 65% said yes.

Apparently it can be concluded that the filled milk product properly made has considerable acceptance in the market and has a good future sales potential provided the economics remain favorable and promotional efforts are made, and particularly if legal barriers are removed.

Imitation milk of the simulated type may be a different story. Imitation milks made completely from non-dairy ingredients could have an economic advantage over filled milk, depending on the formulation used and on the comparative costs of skim milk used in filled milk. However, to date, the flavor quality and nutritional acceptance of the product is not on a par with filled milk. There is less legal restriction for the simulated product. It is not subject to the provisions of the filled milk act but some States prohibit its sale and at least 32 States permit its sale. Since both the filled and simulated milk products are required to be labeled "Imitation Milk" in some States,

much concern has been expressed over the confusion on product identity, primarily because of nutritional implications.

Since milk is consumed on a regular basis and constitutes a major part of the diet for infants, children, adults and persons with special disabilities, and since milk and its products provide 77% of the calcium, 45% of the riboflavin, 24% of the protein, 12% of the Vitamin A, 10% of the thiamin and significant quantities of B_6, B_{12} pantothenic acid, folic acid and essential trace minerals in the Nation's diet, it is believed that a product labeled "Imitation Milk" should meet the same nutritional excellence as milk, since the word "milk" used with the word "imitation" would imply nutritional equivalance in the consumer's mind. If they are not nutritionally equivalent, however, the general acceptance of simulated milk could have a deleterious effect on the Nation's diet.

On May 18, 1968, The Commissioner of the Food & Drug Administration (3) published proposed standards for imitation milk and other fluid imitation products listing minimum levels for fat content, protein content (and protein quality equivalent to Casein), calcium, phosphorus, vitamin A, and riboflavin, and made addition of vitamin D optional at the 100 USP units/8 oz level. It also provides that if the product is below standard with respect to any of these, it should be so stated on the label, "low in protein," etc.

Reactions to this proposal have been varied. A large segment of the industry opposes the adoption of standards for imitation milks and creams on the basis that until evidence of nutritional equivalence of these simulated products can be demonstrated, the best interests of the public would be served by dissociating the name of these products from milk and its products. Many feel that there may be a place in the market for these products but that they should be identified by name, color, flavor, package design in such a way that they cannot be mistaken for milk. The name "Imitation Milk" should be reserved for those products with demonstrated nutritional equivalence.

In addition to the proposed Standards, if one is to call the product "Imitation Milk," suggestions have been made that the type of fat be specified, for fat modified diets, a fat containing 25% linoleic acid be considered, methods should be specified for determining the biological value of the protein, amounts of B_6, B_{12}, niacin, folic acid, pantothenic acid, Vitamins E and C comparable to levels in milk be included and that amounts of sodium and potassium be limited to the amounts present in milk. Also included in the suggestions has been the proposal to include optional addition of trace metals such as copper, iron magnesium, manganese and zinc.

The California Legislature has a bill pending (No. 1459) which would make the addition of at least 8.5% milk solids not fat mandatory for products labeled imitation milk (4).

It would appear that the technology is fast approaching the point where a good flavored vegetable-based simulated milk product can be produced, and produced economically; under these conditions there should be a future for such a product. Nutritional implications and present activities would seem to indicate that the labeling may be something other than imitation milk, something dissociated from milk until nutritional equivalence can be proven. Specially formulated complete vegetable based beverage products with good flavor, free of toxic materials, produced under sanitary health regulations with good nutritional value even labeled by some other name should meet considerable acceptance. Among certain religious groups where meat and milk cannot be consumed in the same meal and for vegetarians such products are sought. In view of the publicity given to the possible lactase deficiency in Orientals and Negroes, a product with little or no lactose may have a place in the market.

Looking into the future and considering all we hear about population trends and the world's food supply, it would seem that development of these vegetable based food beverages should be actively encouraged. However, much nutritional research needs to be done on formulated foods which purport to simulate the natural food products and the results of these studies should serve as a guide to promote and label these products. Products of this nature should be sold on the basis of their own merits.

REFERENCES

1. Milk Industry Foundation, "The Impact of Filled and Non-Dairy Products," 1968.
2. USDA—Economic Research Service, "Dairy Situation," 1968.
3. Federal Register, May 18, 1968.
4. Cheese Reporter *92*(1), August 23 (1968).

• *New Products*

A converter that makes it possible to use a pH meter as a volt-ohmmeter is now available from ORION RESEARCH INC., Cambridge, Mass. 02139. The new Digital Volt-Ohmmeter Converter Model 615 makes it possible to adapt any pH meter having a full-scale range of one volt or less for voltage or resistance measurement. The Model 615 similarly converts the Orion Digital pH/mv Meter Model 801 for dual service, thereby introducing to the chemical laboratory at an exceedingly modest cost capability for high-precision, digital display readout of electrical as well as specific ion and pH values. Setting of a single control on the Model 615 determines the reading mode of the pH meter.

The ATKINS TECHNICAL INC. dewpoint probe is the world's most miniaturized and inexpensive version of an established technique: thermal nulling using hygroscopic salts. As the salt is only the heating element for the 0.06″ × 0.045″ thermistor sensor, minor contamination and salt thickness variations affect dewpoint response time but not final readings significantly. The Atkins 32H65 indicator displays air dewpoint directly on the meter, and with a turn of the knob reads air temperature on the same meter. Among other major application areas for the new Atkins equipment are food storage, agriculture, air pollution, constant-temperature rooms for computers, research and testing. For further information write to Atkins Technical Inc., University of Florida Station, Gainesville, Fla. 32603.

A new low-priced, but very powerful magnetic stirrer is now available for general laboratory use. Called Dylastir, the product is marketed by WILL SCIENTIFIC, and is a companion appliance to the firm's economical Dylatherm hot plate. Dylastir's powerful induction motor is capable of turbulent mixing in even the most viscous liquids—stirs 800 ml of 99% glycerine without difficulty. Convection cooling gives a low 2 F temperature rise in prolonged use, ideal for mixing temperature sensitive preparations.

The MICRO-TOL ENGINEERING CORP. has introduced the Micro-Tol Model RM-6 resolution multiplier, a convolution-deconvolution device which can analyze continuous curves and spectra. In the automatic deconvolution mode, the unit functions as a resolution enhancement device by resolving a curve into its component parts. In this mode it can be used as a quantitative instrument for major constituents as an adjunct to a basic piece of analytical equipment. It can multiply the resolution of mass spectrometers, gas chromatographs, and other types of continuous spectra producing devices. It is a specialized analog computer designed specifically for the analyst who desires increased resolution performance above that which his basic analytical instrument can provide. The resolution multiplier is automatic and simple to operate and the results produced are independent of operator interpretation. For more information contact: Micro-Tol Engineering Corporation, P.O. Box 154, State College, Pa. 16801.