

Table 1. List of components which contribute to the difference in flavour between UHT- and low-pasteurized milk.

No	Component	Sign	No	Component	Sign
14	dimethylsulphide	+ U/P	149	acetophenone	+ U/P
49	i-butyl mercaptan	× U	155	nonanone-2	× U/P
66	dimethyldisulphide	+ U	172	*	× U
73	methyl thiophene	+ U	184	*	× U
78	ethyl isothiocyanate	+ U	188	benzthiazole	× U/P
89	furfural	+ U	192	γ -octalactone	× U/P
92	*	+ U	198	Δ -octalactone	× U/P
104	heptanone-2	× U/P	202	undecanone-2	+ U/P
108	furyl methyl ketone	+ U	212	γ -nonalactone	+ U
123	2,3,4-trithiapentane	× U	218	Δ -nonalactone	+ U
	3-butenyl i-thiocyanate	+ P	233	γ -decalactone	+ U/P
130	octanone-2	× U/P	241	tridecanone-2	+ U
	1-octene-3-ol	+ U/P	258	Δ -undecalactone	+ U
143	2-ethylhexanol-1	+ U/P	271	γ -dodecalactone	+ U
145	*	× U	296	Δ -tridecalactone	+ U

Legend:

- + component contributes to the flavour difference
- × component strongly contributes to the flavour difference
- U/P component present in UHT and in LP milk. Its quantity in UHT milk is larger
- U component present in UHT milk only
- P component present in LP milk only
- * unidentified component.

flavour defects. This phenomenon is also true of a great many other food products. The flavour component balance also plays a role in the differences in sensory properties between low pasteurized milk and UHT-sterilized milk.

Investigations concerning the flavour of milk and heated milk have been carried out at our Institute for quite some time, and some of the preliminary results were presented at the 20th International Dairy Congress in Paris in 1978. The differences in flavour component balance between low-pasteurized and UHT-sterilized milk have also been studied, and some of the results obtained are presented in Table 1.

Some aspects of fluid milk consumption in the Netherlands

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Introduction

Annual consumption per capita of whole milk in the Netherlands decreased from 109.2 kg in 1960 to 46.5 kg in 1977. This decrease was not balanced

by the increase in consumption per capita of low-fat milk which amounted to 4.2 kg in 1970 and increased to 22.7 kg by 1977. During the past twenty years consumption per capita of yoghurt, desserts and special milk drinks has increased too. The point of time and the consumption level at which this decline in consumption per capita of whole milk will stop, depend on autonomous developments in consumer behaviour and on marketing policies of producers and middlemen. Therefore some aspects of consumer behaviour with respect to milk will be discussed and some inferences for marketing policies are made.

Consumer behaviour

Perception. In a national survey (4) in 1978 Dutch adults, judging the most appropriate properties of products, considered whole milk to be natural, healthy and wholesome, and low-fat milk to be natural, healthy and easy to digest. In the same survey three appropriate characteristics, both of whole milk and of low-fat milk, were considered to be freshness, taste and neutrality; attributes like aroma and full flavour scored high for coffee but not for milk. Putting 20 non-alcoholic beverages in order of appreciation, whole milk was ranked fifth by male respondents and seventh by female respondents. Results of this survey in 1978 on product image and taste were similar to those of a survey in 1972, which contained the same questions (2). The contrast in these surveys between the good image of whole milk on the one side and the decrease of consumption per capita on the other side, suggests that consumers have a low interest in milk.

In a research on perception of milk and milk products, using multi-dimensional scaling, two main dimensions could be extracted: a dimension 'low fat content/high fat content' and a dimension 'modern/traditional'. From this analysis whole milk should be classified as 'high fat content', 'traditional' while the reverse holds for low fat milk (4). Fat content in whole milk seems to affect consumption in a negative way.

Habit formation is important for milk consumption. Habits are often formed during childhood. It has been argued (1) that parental authority forcing children to drink milk has a detrimental effect on their milk consumption later in life. In this respect it is encouraging that the percentage of women and men in the Netherlands who feel that one should never force children to drink milk increased from 40 % in 1972 to 48 % in 1978 and 46 % in 1972 to 49 % in 1978, respectively (4).

Ways of consumption are very important to the marketing of milk. Fluid milk is consumed in the Netherlands mainly at breakfast and lunch, but at these meals coffee and tea are still more important beverages than milk (4).

Purchasing patterns for fluid milk in the Netherlands have changed dramatically. In the Netherlands market for fluid milk milkmen had a market share of 91 % in 1959 but this share decreased to 36 % in 1978; market share of food shops increased from 0 % in 1961 to 57 % in 1978. Probably as a result of this shift in consumers' point of purchase, frequency of purchase decreased from 4.1 times per week in 1972 to 3.2 times per week in 1978 (4). It has been estimated that the difference between annual consumption per capita of fluid milk of families buying primarily (≥ 50 %) milk from the milkman and families buying primarily (≥ 50 %) milk in the food shop was 9.8 litre due to the difference in point of purchase (5). The main arguments of housewives who switched from milkman to food shop were 'buy milk together with other products' and 'price is lower' (5).

Marketing policy

Product. In order to stimulate milk consumption, milk should be served appropriately. In a survey on milk consumption, teenagers said they would drink more milk if it were served cool (3). Development of special milk beverages seems valuable to stimulate consumption outside meals.

Price. A decrease in price does not seem to stimulate milk consumption, but in the Netherlands is a major factor in switching demand from one type of shop to another.

Promotion for fluid milk in the past has been mainly collective promotion by the Netherlands Dairy Bureau for the generic product. Promotion for specific brands of milk is increasing as a result of concentration in the dairy industry and of the consequent increasing importance of brand policy.

Distribution. The shift in point of sale of fluid milk in the Netherlands has important consequences for marketing policies of dairy companies vis à vis milkman or food shop. They differ with respect to price (quantity discounts), promotion (joint programmes with retailers), product (assortment, private label), package (bottle or carton) and distribution (in particular logistics).

General conclusion

To stimulate fluid milk consumption dairy companies should make great efforts to: a) increase consumer's involvement in milk as a natural and healthy product, b) develop special milk beverages to increase milk consumption outside meals, c) stimulate milk consumption at breakfast e.g. by combining milk with cereals, d) develop market segmentation, i.e. serving different market segments, such as restaurants versus home or young versus old.

References

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Proceedings of the General Meeting of the Association for the Advancement of Dairy Science, 17 May 1979, Ede, the Netherlands: Symposium on the structure and properties of milk proteins

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Present state of research on milk proteins

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Research on milk proteins deals with two rather different types of protein, the less structured caseins (~ 80 %) and the globular whey or serum proteins (~ 20 %)

The casein research of the last decennia has been stimulated particularly by phenomena and problems connected with well-known dairy products like cheese, evaporated milk, chocolate milk, sterilized milk. The progress of the research can easily be illustrated by means of the β - and κ -caseins. The properties of these typical non-globular, strongly associating proteins and their part in the stabilization of the casein micelles can reasonably be explained from their known amino-acid sequence.

The importance of the knowledge of the action of proteolytic enzymes on casein appears from milk clotting, cheese ripening and the clearance and thickening of sterilized products.

As to the whey proteins the situation is quite different. These proteins, especially β -lactoglobulin, have for a long time been subjects of excellent