Can health benefits break down Nordic consumers' rejection of genetically modified foods?

A conjoint study of Danish, Norwegian, Swedish and Finnish consumers preferences for hard cheese

Poster session paper

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Abstract

In general, Nordic consumers perceive foods that are processed in traditional ways as more healthy than novel foods including genetically modified and functional foods. But because the use of genetic modification in the production of pharmaceuticals is readily accepted, the food industry believes that genetically modified functional foods can be a potential wallbreaker for the use of GMOs in food production, that is: if European health claim legislation is deregulated as expected.

This paper presents the preliminary results of a conjoint study of 750 Danish, Swedish, Norwegian and Finnish consumers' preferences for genetically modified and conventional cheese with different types of health benefits. Before implementing the conjoint task, two thirds of the respondents were asked to taste a cheese, which was supposedly genetically modified.

The results showed homogeneity in preferences within as well as across countries. In general, the genetically modified cheese was rejected, but this was modified somewhat by health benefits and tasting experience.

Introduction

Research has consistently shown that European and especially Nordic consumers' rejection of genetically modified foods is strong, persistent (Bredahl, 1999) and immune to information campaigns and other attempts to change the attitudes (Scholderer, 1999). It has been stressed that the only possible way to break down the rejection is to offer a substantial and trustworthy consumer benefit (Hamstra, 1995).

In contrast to food applications, Europeans more readily accept the use of genetic modification for medical purposes (Frewer & Shepherd, 1995). This fact may constitute a window of opportunity for genetically modified foods with documented health benefits. This is one reason why the food ingredients and additives industry see functional foods as a potential wallbreaker for genetically modified foods.

The problem with this strategy, however, is that the rejection of genetically modified foods is influenced by number of ethical, environmental, and health-based risk perceptions, of which the later is clearly the most important (Bredahl 1999). Thus, because genetically modified foods are perceived as inherently detrimental to personal health, it is not an easy task to convince consumers that a genetically modified food product can offer a substantial health benefit, even if such a product could be developed.

The first step in the introduction of such a product on the market would be to convince consumers to taste it. This could in itself reduce the perception of genetically modified foods as inherently dangerous and alien. If at the same time it was possible to convince consumers that the genetically modified product offered a substantial health benefit, this could improve re-buy probabilities.

In general, consumers in Nordic countries perceive foods that are processed in traditional ways as more healthy and natural than novel foods including GMOs and functional foods (Bech-Larsen, Poulsen & Grunert, 1999). Notwithstanding this, the existence of segments of Nordic consumers with positive preferences for functional foods and the health benefits they provide, are indicated by a number of studies (Poulsen, 1999). In general, consumers perceive functional foods as placed somewhere in the middle of the combined "naturalness-healthiness" continuum from organically processed to genetically modified (Bech-Larsen, Poulsen & Grunert, 1999). Hence, one way to introduce a genetically modified food with a health benefit would be to position it as a genetically modified functional food.

Design and implementation

This paper presents the preliminary results of a conjoint study of 750 Danish, Swedish, Norwegian and Finnish randomly selected respondents' preferences for genetically modified and conventional hard cheese with different types of health benefits. Before rating the preference for each of 16 product profiles the respondents were asked to taste a piece of cheese. In each country, one third of the respondents were told that the type of cheese in question was produced by conventional methods, one third were told that it was produced by the aid of genetically modified starter, and while this was also the case for the last third of the respondents, this group were told that the genetically modified starter implied a health benefit, namely a substantially lower level of calories. In addition to the preference rating task, a number of food related attitude scales consisting of four to six items were implemented, i.e. "interest in natural products", "attitude to the use of genetic modification in food production", "attitude to nature", "attitude to technology". Also a single item measure of self-perceived knowledge of the use of genetic modification in food production was implemented.

The conjoint task was based on an orthogonal 6-factor design, each with two or three levels. Genetic modification was operationalized by the specification of starter cultures which were either conventional and alive in the final product, genetically modified and dead in the final product or genetically modified and alive in the final product. Apart from the price factor the other factors were in some way related to health consequences. Based on studies of consumer preferences for functional foods (Bech-Larsen, Poulsen & Grunert, 1999; Jonas & Beckmann 1998) and discussion with experts in cheese processing we chose to include factors with different types of health implications and connotations to artificiality. The study was implemented as a full-profile design with 16 product descriptions which were to be rated on a 7-point scale of buying intention.

Table 1 Design of the conjoint task

FACTOR		OPERATIONALIZATION
LOWFAT	not lower	- none -
	lower fat content	with less calories, but same texture
FATTYPE	not more	- none -
	more un-saturated fat	which lowers the risk of cardiovascular diseases
CALCIUM	not extra	- none -
	extra	which reduces the risk of brittle bone disease
ZINC	not extra	- none -
	extra	which is good for the immune defence and metabolism
PRICE	market price	The price is average for this type of cheese
	+25%	....25% above average ---
	-25%	....25% below average ---
STARTER	GMO (living)	a genetically modified culture, which is alive and viable in the final product
	GMO (not living)	a genetically modified culture, which is present but not viable in the final product
	no GMO	a conventional culture (without genetic modification), which is possibly viable in the final product

Results

In this section we first present the general results of the conjoint study. Then the relations between the conjoint results and the attitude scales are discussed, and finally we discuss the effects of tasting supposedly genetically modified cheese on the estimated conjoint preferences for genetically modified and conventional cheese.

Figure 1 shows the relative importance of the six factors derived from the estimated aggregate conjoint in each of the four countries. From figure 1 it is clear that the GM factor overshadows all the potential health benefits in all four countries. Apart from Sweden, the respondents in all the countries surveyed also base their ratings less on the price factor than on the GM factor.

Figure 1 Relative importance in % of the six factors in Denmark, Norway, Sweden and Finland

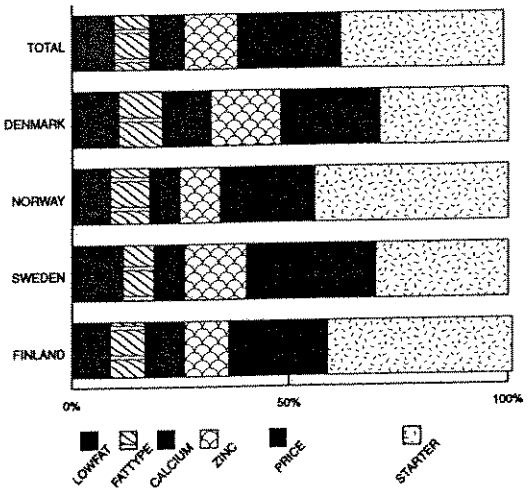


Table 2 shows that the homogeneity in the Nordic countries not only concerns the relative importance of the six factors included in the study, but also the preferences for the levels of the most important factors, i.e. GM and price are similar. As expected, cheaper products are preferred to more expensive products, and no GM products are preferred to GM products with non-viable starters, which again are preferred to GM products with viable starters.

As regards the factors related to health benefits, the preferred levels of calories, saturated fat, and calcium are also mostly in accordance with expectations. The part-worths are small, however, and this may explain unexpected results such as the Danish respondents' preference for saturated fatty acids. The fact that the Danish and Swedish respondents have strong aversions towards the cheese with high levels of zinc confirm other studies of functional foods (Poulsen, 1999) that found consumers to perceive such additives as less natural and hence less preferable than more "natural" additives such as calcium.

Table 2 Aggregated utility functions for each of the four countries

FACTOR		PART WORTHS				
		Total n=753	Denmark n=181	Norway n=199	Sweden n=169	Finland n=204
LOWFAT	less calories	0,07	0,15	0,08	0,05	0,09
FATTYPE	less saturated fat	0,02	-0,08	0,08	0,00	0,04
CALCIUM	more	0,04	0,02	0,07	-0,01	0,09
ZINC	more	-0,12	-0,33	0,06	-0,30	0,04
PRICE	average	0,09	0,01	0,24	-0,04	0,13
	average +25%	-0,56	-0,41	-0,66	-0,76	-0,41
STARTER	GMO (viable)	-0,62	-0,31	-0,88	-0,36	-0,84
	GMO (not viable)	-0,33	-0,22	-0,51	-0,38	-0,31
	no GMO	0,94	0.53	1,39	0,78	1,04
Pearson's*		0,99	0,93	0,99	0,93	0,99
Kendall's tau*		0,87	0,78	0,88	0.85	0,88

*Significances are in all cases 0.00

For each of the four countries and the aggregated set of individual utility functions a hierarchical clustering procedure was performed. In all the cases the great majority of respondents were placed in one segment. This findings confirm the homogeneous preferences of the respondents which is also indicated by the high values of the Pearson's and Kendall's tau measures of the estimated models (see table 2). Hence the conclusion is that the rejection of specific genetically modified foods in all four countries is so homogenous and perpetrating that it makes no sense to speak of benefit segments in this connection.

This does not necessarily mean, however, that consumers with different general attitudes and knowledge about food production do not differ as regards their rejection of specific novel foods such as GM-based cheese with different types of functional benefits.

Table 3 illustrates the reliabilities for the scales of attitudes to: the use of GM in food production (4 items), technology (5 items), nature, and interest in natural products (each 6 items). The table also illustrates the correlation between these scales, a single item measure of the respondents' self-perceived knowledge of the use of genetic modification in food production and the conjoint utility of the use of a non-GMO starter.

The negative correlation between the general attitude to the use of genetic modification in food production and the utility of the use of a non-GMO starter is as expected. Below the low correlation between self-perceived knowledge of the use of genetic modification in food production and the utility of the use of a non-GMO starter will be elaborated on.

The four attitude scales are highly correlated. Especially strong is the negative correlation between the attitude to GMO in food production and the interest in natural products. This result is in accordance with previous studies (Bech-Larsen, Poulsen & Grunert, 1999), reporting that natural/ecological and genetically modified foods are seen as opposites.

The attitude to technology is strongly correlated with the three other scales, but not with the self-perceived knowledge of the use of genetic modification in food production. That the correlation between the later and the attitude to using genetic modification in food production is of a moderate size indicates that this attitude is largely independent of self-perceived knowledge of the use of GMO in food production.

Table 3. Scale reliabilities & Correlation Coefficients for attitude scales, self-perceived GMO knowledge and the utility of the use of a non-GMO starter

	Cronbach Alpha	Attitude to technology	Attitude to GMO in food production	Natural product interest	Attitude to nature	Perceived knowledge of GMO
Utility of non-GMO starter		-.14	-.45	.30	.11	.07
Attitude to technology	0.60		.29	-.30	-.33	.04
Attitude to GMO in food production	0.88			-.47	-15	-.11
Natural product interest	0.72				.24	.13
Attitude to nature	0.79					.12

* All correlations are significant at the 0.05 level

The fact that the correlation between the self-perceived knowledge and the attitude to using genetic modification in food production is negative (see table 3) indicates that, if anything, more knowledge leads to more negative attitudes to genetically modified foods. This is further strengthened by the results presented in table 4, where the conjoint utilities for the non-modified cheese starter is crossed with self-perceived knowledge of the use of GMO in food production. Only the 14 respondents who strongly agree that they are very knowledgeable in this regard, are in favour of cheese produced with genetically modified starter culture.

The fact that most respondents do not see themselves as knowledgeable as regards GMO and the low correlation between knowledge and the general attitude to genetically modified foods, indicate that respondents are looking for facts and experience, when they are asked to elicit their preferences for specific genetically modified foods. We elaborate on this issue below.

Table 4. "I personally am very knowledgeable about the use of genetic modification in food production"

	Strongly disagree						Strongly agree
	1	2	3	4	5	6	7
Mean utility for No GMO	0.72	0.87	1.05	1.08	1.19	1.26	-0.12
Number of respondents	179	170	113	130	94	46	14

The results in figure 2 indicate that consumer rejection of genetically modified foods is changed by tasting experience, and that this is especially the case if consumers believe the genetically modified cheese to offer a health benefit, i.e less calories. An ANOVA-test ($p<0,05$) with the utility of the use of a non-GMO starter as dependent variable and tasting condition as independent variable illustrates that the differences illustrated in figure 2 are significant.

An explanation of the results illustrated in figure 2 could be that respondents who agree to taste a genetically modified cheese (less than 3% refused to taste the GM cheeses) "un-link" their preference for such a product from their strongly negative attitudes to the use of GM in food production. Thus, the mere experience that GM cheese does not taste any different from cheese produced with conventional starters may improve acceptance of genetically modified cheese.

The results illustrated in figure 2 also have striking implications for measurement of preferences for specific genetically modified foods. As discussed above, the lack of knowledge of the use of genetic modification in food production potentially implies that respondents are looking for evaluation bases, when they are asked to elicit their preferences for specific genetically modified foods. The tasting conditioning is one such evaluation base. But the fact that other bases, which the interviewer may be unable to control, make such preferences measurements very sensitive.

Figure 2. Utility for the three levels of starter culture under different tasting conditions

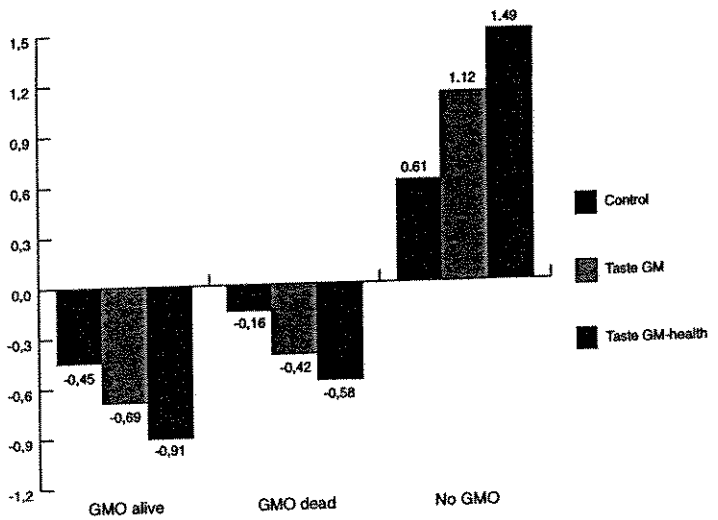
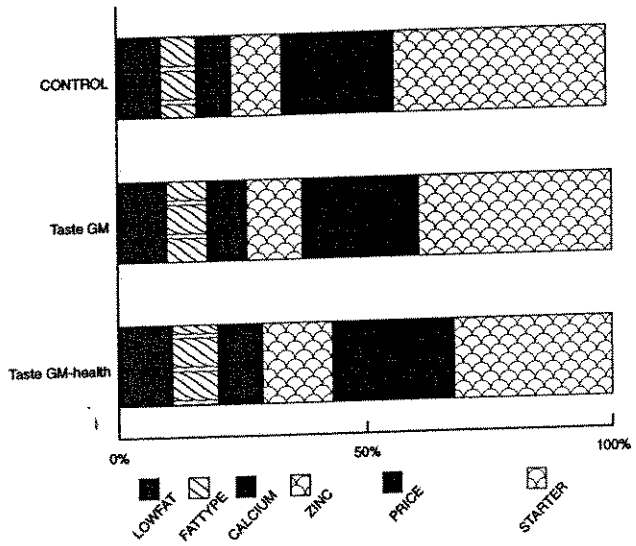


Figure 3 illustrates that the reduced relative importance of the GM factor in the two groups that tasted of GM cheese as compared to the group that only implied a marginal increase in price sensitivity (the relative importance of price is approximately constant in the three groups. That the same holds true for three of the four health factors (calorie level, content of unsaturated fatty acids and calcium) indicate, however, that the lower degree of rejection of genetic modification does not necessarily imply an increased focus on health benefits.

Contrary to this, what seems to have happened in the case of the group who tasted the supposedly low-calorie version of the GM cheese, is that some of the consumer scepticism has been moved from the use of genetically modified starters to the adding of zinc. These results illustrate that taste experience together with substantial health benefits may improve acceptance rates of specific genetically modified foods, but that care should be taken to develop foods with health benefits that are trustworthy and demanded by consumers.

Figure 3. The relative importance in % of the six conjoint factors for the three groups with different tasting conditions



Comments and implications

The results of the study reported in this paper imply that health benefits do not as such increase consumer acceptance of genetically modified foods. Nordic consumers' rejection is so persistent that not even the introduction of genetically modified foods with substantial consumer benefits can change it. In other words, substantial benefits, e.g. health related ones, are a necessary but not a sufficient condition for increased consumer acceptance.

Although the public is largely unaware of the existence of genetically modified foods, more than 20% of the foods recently analyzed by the Danish Ministry of Food, Agriculture and Fisheries contained genetically modified ingredients. In the Nordic countries, the dominant strategy of the food industry has been not to make public the increasing use of genetically modified ingredients in their products. In stead of trying to lure the consumers into acceptance of genetically modified foods, our study indicates that a promotional strategy, e.g. by giving free samples of a genetically modified product with a substantial consumer benefit, may be a

better alternative. The rising scepticism in the US, where consumer experience with genetically modified food is larger than in Europe illustrates, however, that consumer attitudes are sensitive to public debate in spite of specific taste experience.

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