R&D REPORT NO. 86

The technical and economic barriers to production of reduced fat bakery products

1999

Campden BRI

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Chipping Campden Gloucestershire GL55 6LD, UK

Tel: +44 (0)1386 842000 Fax: +44 (0)1386 842100 www.campden.co.uk

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TM Sharp

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SUMMARY

This project, funded by MAFF, investigated the technical, economic and legislative barriers to the production of reduced fat bakery products (RFBP). It was part of a broader study, which also included the barriers to the consumption of RFBP, and this is reported separately in R&D Report No. 85.

In-depth interviews with 24 companies representing ingredient suppliers, manufacturers and retailers were conducted using a structured approach which questioned their product range, nutrition policy, problems in developing RFBP and the knowledge to do so. An industry view of consumer reaction to RFBP was also sought.

Two internationally recognised experts in bakery/reduced fat products also participated in the survey.

RFBP, for the purposes of this study, were defined as biscuits, cakes and pastries since these make the most significant contribution of fat to our diet.

The results show that overall industry is very aware of Government's nutrition policy and regulations for product claims, although labelling requirements were thought to be restrictive. The industry view is that a reduction of less than the current 25% should be used to trigger a "reduced fat" claim, thus easing the development of new products.

The manufacture of RFBP is more difficult than for standard products due to different dough handling properties and shorter production runs and therefore the costs of production are higher.

RFBP quality is often lower, with denser and drier textures and generally shorter shelf life. New product development is more complex and ultimately also adds to the cost of the RFBP.

There are few, if any, single ingredients, which can replace fat in bakery products, and knowledge of ingredient application is not considered high.

Industry believes that consumers do not wish to pay more for RFBP even if manufacturing costs are higher, and this creates another barrier. There is also no incentive for incremental reduction of product fat contents if this is below the threshold at which claims can be made.

Generally, the level of scientific and technical knowledge about fat reduction is low and there is no strategic approach to increasing the availability of RFBP. Government can have a role in encouraging RFBP development by funding research in this area.

Finally the current market for RFBP is approx. 5% of all biscuits, cakes and pastries and it is believed that this proportion will be increased if some of these technical barriers can be removed.



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* RFI	BP = Rec	duced Fat Bakery Products	

To Identify the Technical and Economic Barriers to Production of Reduced Fat Bakery Products (n/ccpadmin/1999/TMS/37284Report)



INTRODUCTION

This one-year project, funded by the Nutrition Unit of the Ministry of Agriculture, Fisheries and Food, aimed to investigate the technical, economic and consumer barriers to the production and consumption of reduced fat bakery products, and to suggest how these may be overcome.

The activities were split between 1) collecting information for the consumer barriers from qualitative and quantitative market research, and 2) a survey of industrial attitudes to the technical, economic and legislative barriers to the development and production of reduced fat bakery products.

In this report, the technical, economic and legislative barriers, as seen by the supply chain for bakery products, are identified and summarised.

SCOPE OF THE STUDY

Using official statistics on dietary consumption within the home (National Food Survey 1996/1998), bakery product groups which contribute significant amounts of fat to the population's dietary intake were identified. These were biscuits, cakes and pastries.

METHOD

Information was collected from contacts within the technical community, who were usually working in companies which are members of CCFRA (Table 1).

The companies selected were ingredient suppliers, manufacturers and retailers and so represented each step of the food supply chain. Two internationally recognised experts in the bakery product/fat reduction field were also contacted since they are key contacts for those in industry who are trying to develop reduced fat bakery products.

TABLE 1: List of Company Contacts by Type

	No. of	Companies Parti	Total	No. of	
				Contacts*	
	Large	Medium	Small		
Ingredient					
Suppliers	6	2	-	8	9
Producers	4	5	3	12	15
Retailers	4	-	-	4	8
Experts	-	-	-	2	2
TOTALS	14	7	3	26	34

^{*} Contacts were working in technical, product development, sales applications, and nutrition functions within their companies.

STRUCTURE OF THE STUDY

A Discussion Guide (see Appendix 1) was developed to cover the main lines of enquiry. Information was gathered by face-to-face discussions with identified contacts, the interviewers using the Discussion Guide as a prompt.

Interviews usually lasted 1-2 hours and were conducted either at CCFRA or at the company itself. Of the 34 total contacts, 17 interviews were conducted with 1 person, 7 with 2 people and 1 with 3 people.

Interviews were conducted between June and September 1998 by Dr. T.M. Sharp and Mr. P.F. Catterall of CCFRA.

A review of fat replacers which are currently available was also carried out and the summary is given in Appendix 2.

Further, to add to the information presented in this study, reduced fat bakery products (RFPB) currently on sale were purchased from retailers. A summary of products available is shown in Appendix 3.

CONFIDENTIALITY

Since some areas of product design and development may be commercially sensitive, it was agreed with all respondents that any information given or discussed would be used in ways which would not be attributable to individuals or their companies.

No company, brand or personal names have therefore been used in this report, except where information is already freely available in the public domain, for instance products on sale to the public.

RESULTS OF THE SURVEY

Important Notes:

- i) All views recorded in this and following sections are based entirely upon the comments received during the interviews, and do not necessarily reflect the views of the author or of CCFRA.
- ii) Where the term "Reduced fat bakery products" is used, it will be abbreviated to RFBP. Its definition is biscuits, cakes or pastries having a fat content which is below that of a similar, standard product.

All comments recorded were the personal and professional views of the contacts interviewed. Although there were large areas of common ground, particularly in relation to the barriers which prevent further development of RFBPs occasionally contradictory information was received. This report attempts to reflect all views since the author considers that all are equally valid.

Comments are recorded under the main headings from the Discussion Guide.

1. WHAT SORT OF PRODUCTS DOES YOUR COMPANY MAKE?

a. Standard Products

Ingredient Suppliers:

Bakery mixes, bakery creams and fillings, emulsifiers, egg products, bulking agents, fruit syrups, starches, stabilisers, fibre, soya protein, dairy products.

Manufacturers and Retailers (by type, not brand name):

Cream cakes, layered desserts, chilled and frozen gateaux, Christmas puddings, celebration and novelty cakes, fruit and plain cakes, sponge sandwich, bar cakes.

Sweet and savoury pies, short and puff pastry, eclairs, cream slices, Danish pastries, spiced and fruited buns, filled flans and tarts, steamed puddings.

Fig rolls, Digestive type, mallow, shortcake, iced and chocolate covered biscuits, cream-filled biscuits, Rich Tea type, custard creams, malted milk, Ginger nut type, bourbon, chocolate-covered countlines.

Cream crackers, water biscuits, crispbreads, Ritz type crackers, cheeselets, grain crackers, twiglet type snacks.

b) Reduced Fat Products

Ingredient Suppliers:

Reduced fat: cake premixes, creams, milk and cream (liquid and dry). Ingredients to help reduce fat: emulsifiers, gums, starches, fruit preparations, fibre, soya, egg and dairy proteins.

Manufacturers and Retailers:

Cakes: Plain and topped cakes, chocolate cakes, hot cross buns, Danish pastries, assembled cake based desserts, hot/cold pies, eclairs.

Biscuits: Digestives (plain and coated), shortcake, custard cream, fig rolls, cream crackers.

Notes:

- i) All retailers and most other contacts already sell some reduced fat products.
- ii) The range of RFBP is relatively small compared to that of products containing fat at standard levels. A ratio of 1 RFBP to 20 standard products was quoted by one respondent. Another quoted the production volume of a reduced fat alternative to be 6% of the standard fat product.
- iii) Most products are in the reduced, rather than low fat, range.
- iv) Low fat products are more common with cakes than biscuits.
- v) Some retailer and private label RFBPs are based upon standard fat alternatives.
- vi) Private label branded ranges are being sold which are based upon claims for fat contents, e.g. "x% Fat Free." Examples, found in most retailers, are the brands "Go Ahead", "Vitalinea" and "Weight-Watchers".

2. HOW IS YOUR CURRENT RANGE CHANGING?

New Product Development:

Across the range of cakes, biscuits and pastries it is clear that new development in the reduced fat area is taking place, although there was a variable response concerning the number of new products. Generally, the retailers expect to launch new RFBPs, in one case doubling the current range, although the more common view was that there will be a small increase in product numbers. These will not necessarily come from all the producers interviewed since some had no immediate plans for new RFBPs, whereas others were planning individual products or even new ranges or range extensions.

The Stimulus for New Products:

Throughout the supply chain it is common for the stimulus for development to come from the customer-supplier relationship, i.e.

Manufacturers	influence	Ingredient suppliers
Retailers	influence	Manufacturers
Consumers	influence	Retailers

Of course the influences are not this simple. Retailers also approach ingredient suppliers, and retailers are also influenced directly by media issues on nutrition and health, and indirectly by the media influence on the consumer. Retailers in particular also showed a high awareness of Government policy and appear to use this in developing parts of their own product strategy.

It also emerged that influence can be two way, so that partnerships for product development are built between retailers and manufacturers.

Further, the stimulus is often internal and is driven by real or perceived competition in the marketplace. So manufacturers do also take the initiative in developing new product ranges to increase their market share and turnover, and retailers may offer these, and their own, new products to secure an advantage over their competitors.

From discussions with retailers, it also emerged that company nutritionists play an important role by interfacing between Government policy on health and nutrition and the development of new products and company policy.

3. IS NUTRITION TAKEN INTO ACCOUNT WHEN DEVELOPING RFBPs?

Are You Aware of Government Health Policy and Nutrition Targets?

Are You Aware of Current Regulations for Reduced Fat Claims?

Overall, there was a very high level of awareness of both Government health and nutrition policy (as defined in The Health of the Nation White Paper) and current regulations for claims for RFBPs, the only exceptions being some suppliers of specialist ingredients who were somewhat removed from the process of new product development.

A number of respondents commented that awareness of both topics was very low amongst consumers.

The general comment was that most developers are interested in the quantity of fat in their products. Although some consider fat quality, this was not the major issue.

Do Labelling Regulations and Guidelines Help or Hinder Development of RFBPs?

There was no concensus here. Approximately 6 respondents, from all sectors, believed that the regulations and guidelines for reduced/low fat claims were helpful since they provide a consistent framework for claims and enable clear and simple messages to be given on product packs.

For others, this was a problem rather than a benefit since information that can be given to the consumer is *too* tightly controlled. An example given was that it is not possible to declare on the front of a pack that the product within contains e.g. 10% fat, yet it may be helpful for a purchaser to know, in simple terms, the fat content of the products. With this information, quick and informed choices could be made without having to refer to the nutrition panel. In itself, this simple change could enable consumers to reduce their fat intakes by easier product selection when shopping for food.

A number of respondents commented that the level of fat reduction needed to allow a reduced fat claim (25%) was too difficult a target considering the technical challenges involved. The overall effect is to limit the number of RFBPs available to consumers, which in turn reduces the opportunity to decrease fat intakes by this route.

One expert view was that changing the figure to a 10% reduction of fat to trigger a claim would encourage the introduction of more RFBPs and therefore reduce consumption of fat.

The reference point from which fat is reduced was thought by some to cause difficulty for two reasons:

i) Sometimes it is not possible to define a standard fat level for a product and

ii) as more RFBPs appear, the reference point itself could change, i.e. the reduced fat version could become the new standard. In this context, reduced fat milk was given as an example.

Some producers mentioned that legislation can lag behind developments. For example, many products have appeared which are a mixture of different components and so do not fit the criteria for certain types of product. An example is a layered dessert which contains cake, but cannot be classified as a cake.

A comment was also made about the criteria for low fat claims which require a fat content of less than 5%. Since many ingredients used already contain some fat (e.g. flour) the target for a low fat claim can be very difficult to achieve. It may be more helpful to make a claim based upon "added fat " to help overcome this problem.

The use of "x% fat free" claims was not fully supported. On one hand the view was that these claims are more easily understood by consumers, but some respondents believe that they are misleading, giving the impression that products may be nearly free of fat, whilst in reality still containing significant levels.

Finally, there were a number of comments about the confusion which exists between various claims, even with the clear regulations and guidelines which are in place. These related to the motivation of consumers to purchase products with reduced or low fat claims. It may be that at times, consumers will buy RFBPs in the belief that they contain fewer calories and will therefore help with weight control, rather than thinking about the effect of fat on diet and health. The criteria for reduced and low fat claims do not at all guarantee fewer calories in the product – in fact other ingredients which are used in place of fat often contribute calories to the product to the same extent as fat (see also Appendix 2 for product derived information).

N.B. Two related questions in the Discussion Guide were "Do you always make claims for reduced fat products?" and "Would you reduce the fat content if no claim could be made?" – The answers are relevant to this section, but cover a number of issues.

It was noted that there must be a justification for manufacturers to reduce the amount of fat in a product. This may be economic, if a cheaper ingredient can be used instead, or technical, if a quality improvement can be achieved. However, the response generally was that if there was no technical or economic justification, <u>and</u> no claim could be made for nutrition, the fat content would not be reduced. The conclusion is that an opportunity is being lost for consumers to purchase products which have small reductions in fat content. Very few of those questioned responded positively to the idea of incrementally reducing fat contents without making claims.

What More Can Government Do to Encourage Development of RFBPs?

The main conclusion was that Government could help further with various aspects of consumer education. In particular, consumers should be made more aware of Government policy and targets for health and dietary intakes. The point was made that although Government publicises the output from the various committees such as COMA, the output is rarely transferred simply and *accurately* through the media to the consumer. Clearer, targetted information would be useful to enable consumers to make more informed purchases. Education on the fat contents of various foods, and clearer and simpler nutrition information on food packaging would help make the choice of RFBPs easier for consumers.

Again, on the same theme, it was mentioned that the industrial sector provides a great deal of nutrition and health information to consumers, but that the level of detail and clarity of the messages can be variable and sometimes may be contradictory. A stronger input from Government could help reinforce clearer messages.

A number of comments were also made about the opportunity for Government to encourage the educational process at school age, for instance by including healthy cooking and eating in the curriculum.

Finally, two other points were made:

- i) Regulatory approvals for new ingredients to replace fat are generally slow and progress in the development of new RFBPs may therefore be inhibited.
- ii) Government could also stimulate this area by funding more research on the role of fat in foods and the understanding of the processing functionality of fat replacers.

4. HOW DIFFICULT WAS THE DEVELOPMENT OF RFBPs?

This group of questions formed the core of the survey and was designed to explore the technical and economic barriers which may restrict the development of RFBPs. Since there is a great deal of information, it is presented under the headings of Technical (production, texture/flavour, shelf-life and overall quality) and Economic.

a. Technical

Production:

The issues mainly relate to biscuits since the reduction of fat content appears to affect the properties of doughs more than cake batters.

Many actual differences were listed for the manufacture of products containing lower fat levels. The comments are qualitative and may not all lead to equivalent problems during production.

Generally, reducing the fat content of doughs changes their handling properties. Reduced fat doughs are firmer, tougher and can be stickier, particularly if high sugar levels are present. This leads to handling and machining problems during production, in particular release from equipment surfaces is more difficult, and it may be necessary to use more release agents, or even Teflon coatings on contact surfaces which cause release problems. The main cause is the loss of lubrication when dough fat is reduced.

Reduced fat doughs are also more abrasive, causing higher levels of wear; for instance, the moulds used for shaping certain short doughs need replacing more frequently.

For hard doughs, using less fat leads to more gluten development during mixing and consequently greater shrinkage of dough pieces after forming. It may then be necessary to add more processing aids to ensure that the dough is more workable during production. This is also true for shortcrust pastry. Also, during hot weather, reduced fat dough toughens more quickly and is more difficult to form into pieces for baking.

For reduced fat biscuits it is necessary to change a number of steps in the manufacturing process, including recipe balance, mixing and baking. Because reduced fat doughs are firmer, more water is added to the recipe. All added water is bound more tightly in the dough and the product must be baked at a higher temperature and/or for longer to achieve the final product colour and moisture content.

Reduced fat doughs are less tolerant to varying process conditions and it was reported that there is a higher level of Quality Control failures, and up to 1% more wastage than standard products.

Since reduced fat doughs have different handling properties, it is less easy to switch between reduced fat and standard production. Changeovers take longer since adjustments have to be made to the production plant. Operators may require additional training to deal with the extra problems which are connected to the manufacture of RFBPs.

Production runs of RFBPs are usually shorter since sales volumes are lower, and this can cause other difficulties. It was reported that a reduced fat biscuit product could not be made by a particular manufacturer since the standard production line was too big for such a short run.

A comment was made about oil spraying which is a finishing process used to impart colour and flavour to baked crackers and biscuits. Some current equipment in use does not always deliver a consistent amount of oil to the product. If a low fat claim is being made, the varying amount of added oil could take the total fat content beyond the 5% maximum which allows the claim to be made.

Finally, the factory may need to carry stocks of a wider range of ingredients since non-standard ingredients are often needed to replace fat.

Texture/Flavour:

There were unanimous views that reducing the fat content of cakes, biscuits and pastries can affect the eating quality of the products.

For cakes, reducing the fat content destabilises the batter foaming properties and leads to collapse and loss of volume during baking, which will not only affect appearance but also produce a denser crumb, giving a firmer eating quality. Even if the reduction of fat is not so great as to cause this problem, the removal of fat makes the cake drier and firmer, less tender, and less cohesive. Breakdown of the crumb during eating is also different and the cake is more difficult to clear from the mouth by swallowing. Colour and flavour also are poorer than the standard product.

Reduced fat biscuits are drier, too crisp and gritty and less easy to swallow, and also suffer a loss of colour and flavour.

In pastry, reducing fat content causes a loss of crispness and lift, and increased dryness with a more brittle and dense texture.

There are particularly difficult problems in reducing the fat level in products which contain high amounts of butter, since its unique flavour and melting profile are very difficult to match with other ingredients. It was also noted that the use of butter and its declaration is a good selling point regarding the quality of the product.

Overall these texture and flavour changes are seen as a matter of degree, so that as more fat is removed the differences from standard products becomes greater. The general view is that a 10% reduction in fat levels will only cause minor changes to product quality, but in the more sensitive products which do not contain much moisture, even 25% reduction can cause easily detectable changes. For products which contain naturally high levels of moisture, for example some types of cakes, it may be possible to reduce fat content by up to 50% with less effect upon product quality.

Shelf-Life:

Biscuits have very good keeping qualities and do not change much during storage so that reducing their fat content has little effect on shelf-life. If anything there may be a beneficial effect since when products contain less fat they are less prone to the development of off flavours due to rancidity.

One storage problem which was mentioned is the defect known as "Checking". This is the spontaneous cracking of biscuits during storage due, not to any physical shock, but rather because of internal stresses set up in the biscuit during baking and cooling. It was noted that the difference in water binding properties of reduced fat doughs can make these products more susceptible to this problem.

Cakes, however, rely on softness and tenderness to create the impression of freshness, and these eating qualities are negatively affected by reducing fat content. Not only does the rate of staling increase when less fat is present in the product, respondents also commented that reduced fat cakes start out drier and firmer, with less flavour than standard products. The perception is that they are already somewhat stale. Their usable shelf-life is thus decreased, which gives problems in the retail distribution and storage chain.

Fillings, toppings and coatings are often an integral part of cakes, biscuits and pastries and are themselves often fat based. There were mixed views about the ability to reduce their contribution to product fat content.

Some respondents have reformulated, for example, chocolate coatings to contain less fat (although compositional standards must be met) whilst others have taken the approach of maintaining the composition of creams and toppings and simply reducing the amount used when they have a higher fat content than the biscuit, pastry or cake with which they are combined.

One point was raised about reducing the fat content of fillings and toppings. If this leads to a higher water activity, increased moisture migration between wet and dry components may affect both eating quality and shelf-life.

Overall Quality:

A number of respondents commented that the single, overall effect of removing fat is to make bakery products less "more-ish".

A number of respondents mentioned that there is another route to overcoming these challenges. This is to make a gradual reduction of bakery product fat contents, over an extended period, in small increments. The effects of this approach would be to minimise any changes to product quality, and also allow consumers the time to adjust to slightly different products. Long term, the fat content of bakery products could be reduced in this way.

The problem, however, is that without some obvious benefit, it is unlikely that the supply chain will adopt this approach. (See also the **NB** in Section 3).

b. Economic

It is clear from the above comments that the reduction of fat in bakery products will have economic implications.

Most directly, either changing the balance of standard ingredients, or introducing new ones will affect the cost of the RFBP. Generally, the comments indicated that the recipe cost is likely to rise since most other ingredients are more expensive than fat and some specialised ingredients are expensive in absolute terms.

Also, there is no single ingredient available to replace fat so that a "cocktail" may have to be used. Inevitably, this will also affect the rate and possibly cost of development of a new RFBP.

The exception here is butter which is expensive relative to other ingredients. Replacement of butter may actually reduce recipe costs but there are technical difficulties in doing so (see previous comments on texture and flavour) and, at this time, it does not appear to be feasible.

Other costs are associated with the increased development time needed for RFBPs: possible capital expenditure to modify production lines, small production runs with a loss of economy of scale, extra staff training in modified production techniques, more expensive packaging costs due to smaller quantities being ordered and more wastage in production.

The actual extra cost has not been quantified and will also depend upon the RFBP being made, and the level of technical and production challenge.

5. WHAT LEVEL OF KNOWLEDGE EXISTS TO HELP DEVELOP RFBPs?

A key area of questioning concerned the knowledge and ingredients available to assist in the development of RFBPs. In this area there was a high level of agreement between respondents, whichever part of the supply chain they represented.

The general view was that the overall knowledge of ingredient functionality and requirements needed to reduce fat contents was quite, to very, low. Know-how exists, but is either fragmented and difficult to locate, or it exists within large companies' technical functions and, for commercial reasons, is not shared. A number of respondents believe that the level of knowledge is higher in the US since the market for RFBPs is more highly developed.

Where there is know-how, it is thought to be in the area of re-balancing and re-formulating recipes to lower fat levels rather than choosing other ingredients for their functionality. A creative approach has been the inclusion of fruit pieces or pastes to create new textures and a variety of flavours, i.e. in terms of constituents, and the replacement of fat with sugars, starches and gums.

Most parts of the supply chain lean on the ingredient suppliers for knowledge, suitable ingredients and problem solving. This does not seem to be working well for various reasons. In general, there is a high expectation that suppliers will understand most about their ingredients. Very often a supplier will develop an ingredient for a particular application and understand how it works through detailed technical studies. The problem arises, though, when new applications are wanted. What usually happens is that a producer or retailer will ask for an ingredient to reduce fat levels in a bakery product and is given something which worked in another type of system. If, as often happens, it fails, neither supplier nor customer understand why and few, if any, solutions can be offered.

The overall feeling, then, is that there are many claims for ingredients which will lower fat levels in bakery products but there are few successes. One producer said "We are on our own" and this seemed to reflect the views of a number of respondents.

Some suppliers commented that when they referred technical problems back to their own R&D Centres the response was disappointing. It was considered that the priority for research and problem solving for RFBPs was low and they did not always respond positively.

The view was unanimous that there is no single ingredient which can replace fat, nor are there any ingredients which offer universal applications for RFBPs. This means that product developers have to use mixtures of various functional ingredients without being clear about their interactions and synergies.

The retailer view was that with too many ingredients available, a lot of development time had to be spent in testing whether they worked. Inevitably, there were a lot of failures and disappointments. When failures do occur it is most likely that, because of the pressures on time, developers will simply move on to another project rather than spend even more time in trying to find another solution.

The view emerged that short-term deadlines for product development are not realistic for RFBPs because of the technical challenges, and that a more strategic approach to their development is needed. In a commercial environment this is very difficult and many expressed the view that this has to be done in corporate research centres, research associations and universities. It was also noted by suppliers that they are unlikely to commit large resources to develop new ingredients unless a sufficiently clear market opportunity could be identified.

Most respondents admitted to having failures in the development of RFBPs. It is not surprising that many expressed the wish to have a single fat replacer which could be widely used in the development of new RFBPs and reduce the amount of development work needed.

N.B. A list of ingredients currently available for the development of RFBPs is given in Appendix 2.

6. HOW DO YOU SEE CONSUMER REACTION TO RFBPs?

This set of questions was designed to probe the developers' view of consumer needs, expectations and behaviour. Consumers were also interviewed as part of the project, results being published in CCFRA R&D Reports 78 and 80.

Quality:

Respondents believe that consumers have certain expectations of product quality. For RFBPs to be totally acceptable, they must match standard fat alternatives in all aspects of quality. The further the deviation from this standard, the less it is likely that the product will be acceptable. The strong view was that consumers rarely buy products for nutritional benefits alone – the main driving force for purchase is the liking for the quality of a product, and these quality attributes are often related to the properties which fat gives, i.e. mouthfeel, succulence, flavour etc.

Expectations are even higher for luxury or indulgence products (cream cakes, gateaux etc) and the view was that consumers will not compromise quality at all on these products, they would simply buy something else instead.

Looking forward, respondents believe that if the quality of RFBPs could be improved to match standard products, there would be a much greater acceptance and frequency of purchase.

It may be that there is a problem with the consumer perception of RFBPs because a number of early products were of insufficiently high quality. A typical attitude would then be "I've tried them, they're no good".

On the positive side it was noted that consumers in general and possibly the younger age profile are getting used to eating lighter, lower fat products in other areas, e.g. dairy, meat and snackfoods, and that this may help with the acceptance of RFBPs.

Claims:

This relates to the claims made for RFBPs on the packaging and links to other consumer expectations, particularly on price, quality and benefits.

Some respondents see Reduced- or Low-fat claims as a deterrent to purchase, in that consumers believe that the quality will be lower than for the standard product, and they have to decide whether to compromise quality for health. The danger is that they may try a product once, on this basis, but often will not make a repeat purchase, which leads to declining sales.

As reported earlier, although there may be a fat claim on the pack, it is believed that sometimes this is confused with calorie reduction and weight control. There may be two distinct types of RFBP buyer, the calorie counter and the fat reducer.

Product claims probably trigger the (unconscious) question "What's in this product for me?" and of course, there must be an answer on the pack or no purchase will be made. Similarly, consumption of the product must also provide an answer, or there will be no repeat purchase.

Price and Benefits:

There was a strong view from producers and retailers that the selling price of RFBPs should be very similar to that of a standard product. Consumers will not pay "more for less", unless the health benefit is very strong.

There was a minority view that it is possible to charge premium prices for RFBPs but it was felt that this would create a niche market.

Prices charged for RFBPs can be higher but the key here is to create a range which is not based on a standard product. Of course the question is then, "How do we know that the price is higher if there is no comparison?"! The true answer will be in the difference between costs and price, i.e. the profit margin. This was seen as an important point since this pricing strategy is more likely to generate income which can be invested in longer term development of the RFBP market.

Behaviour:

Although this is covered in detail in the consumer study, respondents in the technical study made comments which should be recorded.

It is believed that the overall picture is complex and that it is the behaviour of the population as a whole which is being considered here.

What is meant is that there are trends in opposite directions. Whilst there does seem to be an enduring consumer interest in fat intake and health, which is reflected by the growth in the RFBP market, at the same time there is a counter trend for snacking and grazing which is based upon the consumption of products of higher fat contents. Respondents were not clear whether the snackers and grazers were also the fat reducers. If so, an increase in snacking and grazing could lead to growth in consumption of RFBPs to redress the balance and reduce the feeling of guilt of sometimes eating "unhealthy" products.

The conflict between indulgence and guilt continues. Luxury products represent the former whereas purchase of RFBPs is seen as a good thing, making the consumer feel less guilty and more virtuous. A number of respondents mentioned that they believe that consumers may eat more reduced fat biscuits than standard fat biscuits, because they contain less fat, and whilst feeling more virtuous, may have actually increased their fat intake from this source.

A further specific point was raised about some types of crackers since these are products which are often eaten with toppings. The effects of reducing fat content have already been described, and lower fat crackers tend to be drier and harder. This may lead the consumer to increase the amount of topping, e.g. spreading more butter or margarine, or adding more cheese. Ironically, again this may lead to an increase in fat consumption. The thought provoking question was raised, would increasing the fat content in crackers, which will create a better texture, lead to *lower* fat intakes through less use of toppings?

7. WHAT IS THE LONG TERM FUTURE FOR RFBPs?

There were differing views about the current and future potential for the RFBP market.

Looking backwards there are some RFBPs which have been on sale for over 5 years but there has been little growth in sales of these products. The key to this has been the development and launch of new RFBPs.

The majority view was that the current market is increasing, interest from consumers and retailers is high and that there are many new products in the development pipeline. This *will* lead to short term market growth.

The longer term situation is less predictable. Again, the majority view is that there is a long term (10+ years) market for RFBPs, but its size is difficult to estimate since it will depend upon a number of factors. These include:

- The extent to which industry understands consumer needs and behaviour
- RFBP quality improvements will increase market potential
- Availability of new ingredients and technologies for fat reduction
- The ability to command premium prices
- A change in nutritional priorities

There are factors which may limit market growth. Apart from a lack of quality improvement, the biggest threat is the extent to which RFBPs will displace the sales of standard products. One retailer mentioned that it was unlikely that they would stock two of everything, i.e. the choice would be to sell the RFBP or the standard product. Another factor, even if both were to be sold, is the extent to which the reduced fat version would gradually replace the standard and become the new norm. In this situation it may be that products with even lower fat contents would then be sought.

Some respondents gave the view that the market was close to peaking, as it has in the US, and that without further stimulus, will always be a niche.

It was agreed that the most positive trend is the appearance of reduced fat bakery products which do not have standard fat alternatives. A number of ranges are now on the market (see Appendix 3) and they have a turnover of £10's million per annum. These may genuinely increase the market because there are no standard products to displace, pricing is not linked to a standard product, and variety within the range is constantly increasing.

SUMMARY OF THE TECHNICAL AND ECONOMIC BARRIERS TO PRODUCTION OF REDUCED FAT BAKERY PRODUCTS (RFBPs)

- The criteria for making reduced fat product claims are too stringent, i.e. less than a 25% reduction would be helpful.
- There is no incentive for incremental reductions in product fat content.
- The manufacture of RFBPs is more difficult because of altered handling and processing properties.
- RFBPs' eating quality and shelf life are generally poorer than those of standard products particularly flavour, texture and mouthfeel, and perception of freshness in some products.
- There are insufficient ingredients available specifically for fat replacement and reduction.
- Available technical knowledge in the area of fat reduction is limited, particularly regarding the processing functionality of ingredients.
- Manufacturing (and possibly ingredient) costs for RFBPs are higher but consumers do not want to pay more.
- Consumer perception is that RFBP quality is lower than that of standard products.
- Consumer purchase intentions and consumption patterns are not well understood.
- There is no strategic approach to increasing the commercial availability of RFBPs.

SUMMARY OF OTHER POINTS

- There is a high level of interest in RFBPs. All contacts agreed to participate in the study.
- Most developments in this area are retailer driven.
- Government health and nutrition policy is well known to the industry.
- The 25% reduction needed to make a fat claim is considered to be technical challenge for many bakery products.
- Similarly the requirements necessary to meet "low fat" criteria can cause problems.
- If no claim can be made, manufacturers are unlikely to reduce the fat content of bakery products.
- Industry sees the main task of Government in this area as consumer education in nutrition and health targets.
- Government can also help by:
 - i) Facilitating the regulatory approach process for new (not novel) ingredients
 - ii) Contributing to the funding of research in the RFBP area.
- The *cost* of RFBPs is higher.
- Consumers apply the same quality standards to RFBPs as for standard products.
- Consumers have been disappointed with the quality of some RFBPs.
- The future growth of the RFBP market may be limited by lack of product quality.
- There *is* future market potential. Reduced fat bakery products, not based on standard versions, may be the way forward.
- Currently RFBPs are approximately 5% of the total market for biscuits, cakes and pastries.

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APPENDIX 1

BARRIERS TO REDUCED FAT BAKERY PRODUCTS DISCUSSION GUIDE

All questions relate to reduced- and low-fat bakery products.

The bold type covers the anchor questions. Within each of these the aim is to address the points listed under each heading.

WHAT SORT OF PRODUCTS DOES YOUR COMPANY MAKE?

Product range - low fat range vs standard products - is product list available? - what is % fat reduction? - what are actual fat contents? - who do you sell to? - who else makes this kind of product?

HOW IS YOUR CURRENT RANGE CHANGING?

Do you have any new products coming through? - who stimulates development? - where do the ideas come from? - do you get many enquiries for low fat products? - is the low fat product market increasing? - do you see a long-term future for low fat products?

DO YOU TAKE NUTRITION INTO ACCOUNT IN LOW FAT NPD?

Are you aware of Govt. policy and nutrition targets? - what is the largest % fat reduction possible for each product? - are you aware of current regulations for low fat claims? - do legal/labelling needs help or hinder your NPD? How? - do you consider fat quality as well as quantity? - what more can Government do to encourage development of low fat foods?

HOW DIFFICULT WAS THE DEVELOPMENT OF LOW FAT PRODUCTS?

What problems do you have? - have you failed? Why? - how do formulation and production costs compare? - do you always make claims for low fat products? - is the quality the same as standard versions? - which suppliers offer fat replacers?

What do they offer? - do they offer technical advice? - how easy are they to produce? - is their shelf-life the same? - do you have to use any special ingredients? - is formulation/production cost more or less? - is there sufficient knowhow for NPD?

Who do you ask for help? - are there sufficient ingredients available for low fat NPD?

What ingredients do you use to reduce fat? - what stops you developing more low fat products? - what are the main problems?

What do you need to enable the development of low fat products? Are you trying to match standard products?

HOW DO YOU SEE CONSUMER REACTION TO LOW FAT PRODUCTS?

Are they as acceptable as standard versions? - are they eaten as often? - how does their price compare with standard products? - why do <u>you</u> think that people eat them?

APPENDIX 2

REVIEW OF FAT SUBSTITUTES WITH PARTICULAR REFERENCE TO BAKERY PRODUCT APPLICATIONS

1. INTRODUCTION

Fat substitutes may be defined as ingredients capable of replacing some or all of the functional characteristics of fat in foods while simultaneously ensuring a reduction in the proportion of energy derived from fat in the particular food in question (1). There are numerous products available on the market or under development which purport to be able to substitute for some or all of the fat in selected food products (2). Fat substitutes are frequently classified according to their structural functionality and may subsequently be grouped as being carbohydrate-based, protein-based, fat-based, or emulsifiers, stabilisers and gums.

2. CARBOHYDRATE-BASED FAT SUBSTITUTES

2.1 Starch-Based Fat Substitutes:

A number of starch-based products are used as fat replacers and are generally low dextrose equivalent maltodextrins manufactured by mild hydrolysis of starch which results in relatively low levels of dextrose. Maltodextrins substituted on an equal weight basis provide 4 kcal/g (3). However, when maltodextrins are used as fat replacers, they are usually dissolved in a water:maltodextrin ratio of 3:1, thus producing a sol or gel providing only 1 kcal/g. Solutions of about 25% solids of these low-DE maltodextrins have a short texture which gives a fat like sensation in the mouth.

Starch-based fat replacers require moisture for their functionality and are most suitable for application in baked goods such as cakes, which contain a relatively high moisture content in the finished product. They are unsuitable for replacing fat in low-moisture products such as crisp cookies or crackers.

Examples of Branded Starch-Based Fat Replacers:

Amalean I; Amalean II; N-Lite; Instant-Stellar; CrystaLean; Maltrin; Rice-Trim; N-Oil; Stadex

2.2 Polydextrose

Polydextrose is a low calorie bulking agent that can replace some of the functions of sucrose in food products. It is formed by the random polymerisation of glucose, sorbitol and citric acid in a ratio of 89:10:1 (4). Polydextrose is most commonly used to replace sugar in

formulating nutritionally modified bakery foods. Polydextrose also has fat sparing properties and may be used to reduce fat content in some bakery foods. It alone, however, cannot be used to replace all of the fat in bakery products and is usually used in combination with other fat sparing ingredients.

Examples of Branded Polydextrose Fat Replacers:

Litesse I; Litesse II; Sta-Lite

2.3 Fibre-Based Fat Replacers:

High-fibre ingredients with low calorie content may be used as bulking agents to replace ingredients with higher calorie contents. Fibre can replace some of the bulking properties of sucrose or fat. A wide array of fibre products are commercially available from numerous plant sources - cereals, fruits, legumes, nuts, and vegetables - and they differ depending on their components.

Examples of Branded Fibre Based Products:

Fibruline; Fibrex; Raftiline; Trimchoice®(Oatrim)

3.0 PROTEIN-BASED FAT SUBSTITUTES

Microparticulate protein can be used to replace fat in some bakery applications. The structure and function of the protein microparticulates is such that their size and shape provide a fat-like mouthfeel. The protein microparticles can be derived from skim milk and/or whey protein. The fat-like characteristics of these microparticles are achieved by hydrating the protein with approximately twice its weight of water. A limiting factor, though, is their lack of heat stability and applications are only possible in unheated products, e.g. creams, toppings, fillings.

Examples of Protein Based Products:

Simplesse; Dairy-Lo

4. FAT-BASED FAT SUBSTITUTES

A number of fat based materials that look, feel, and act like fat but do not provide the calories of fat are under development. Olestra is the most widely known fat-based fat replacer, and is the common name for the mixture of hexa-, hepta-, and octaesters formed by the esterification of sucrose with long-chain fatty acids derived from edible oils. These have yet to be approved for use in the UK or EU.

5. EMULSIFIERS AS FAT SUBSTITUTES

Emulsifiers can replace all or part of the fat in many food products. Emulsifiers used include mono- and di-glycerides, sucrose esters, propylene glycol monoesters, sorbitan fatty acid esters, polysorbates and various combinations. Emulsifiers function by sparing or stretching the reduced quantity of available fat. Whereas carbohydrate-based fat substitutes are used primarily in bakery foods with intermediate- or high-moisture contents, emulsifiers appear to have functionality in low-moisture bakery applications.

6. GUMS AS FAT SUBSTITUTES

Gums, also referred to as hydrophilic colloids, are frequently found in reduced-fat or fat-free bakery foods (5). Gums do not necessarily serve as direct fat substitutes, but they are used at low levels (0.1-0.5%) to imbibe water and contribute viscosity (6). It may be speculated that by increasing the viscosity of the batter, gums assist in providing aeration during mixing, which would tend to improve baked volume and crumb structure. Added to dry ingredients in bakery products, gums increase the soluble dietary fibre and increase water holding capacity so that the water serves as the bulking agent without altering the original identity of most products. Gums commonly employed for these purposes include agar, alginate, arabic, carageenan, konjac, guar gum, high and low methoxyl pectins, xanthan gums, and cellulose derivatives.

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APPENDIX 3

OVERVIEW OF REDUCED FAT BAKERY PRODUCTS AVAILABLE FOR SALE

 $Table 1: \ \ Overview \ of \ Reduced-Fat\ /\ Low-Fat\ /\ \% \ Fat\ Free\ Bakery\ Products\ Available\ in\ a\ Range\ of\ Supermarkets\ on\ 25.9.98$

Product	Brand	Product	Fat Related Claim	Overview of Components Used to Achieve Fat Reduction	Full Fat	kCal/	Fat/	Weight	Cost
Category					Equivalent	100g	100g	(g)	£
Cake	Sainsbury	Sultana & Cherry Cake	96% Fat Free	Wheat, corn & tapioca starch; emulsifiers, gums/ fruit	No	267	2.9	286	0.99
Cake	Sainsbury	Orange Cake	96% Fat Free	Wheat, corn & tapioca starch; emulsifiers, gums/ fruit	No	264	3.3	280	0.99
Cake	M&S	Apricot Flapjacks	95% Fat Free	Addition of oats & apricots	No	360	3.5	200	1.39
Cake	Trimlyne	Carrot/Orange Cake	96% Fat Free	Fruit/oatflour/emulsifier/no fat/flavour	No	244	3.2	300	0.95
Cake	Trimlyne	Rich Genoa Cake	97% Fat Free	Fruit/oatflour/emulsifier/no fat/flavour	No	264	2.9	300	0.95
Cake	Entenmann	Chocolate Fudge Brownie	95% Fat Free	Fat reduced cocoa/emulsifiers/ckae crumbs/stabilisers	No	310	4.4	495	1.69
Cake	Entenmann	Raspberry Danish Twist	95% Fat Free	Jam/stabilisers/potat flour/orange juice	No	295	3.7	489	1.79
Cake	Entenmann	Louisiana Lemon Split	95% Fat Free	Filling/potato flour/sugar/emulsifiers	No	253	2.2	350	1.79
Cake	Entenmann	Double Chocolate Muffins	95% Fat Free	Sugar/defatted cocoa/ emulsifiers/ potato flour/thickeners	No	262	4.7	58x4	1.19
Cake	Entenmann	Double Berryburst Muffins	95% Fat Free	Sugar/fruit/emulsifiers/thickeners	No	238	2.1	58x4	1.19
Cake	Go-ahead	Double Caramel Cake Bar	94% Fat Free	Caramel filling/ emulsifiers	No	301	4.4	150	0.95
Cake	Go-ahead	Double Chocolate Cake Bar	95% Fat Free	Choc. filling/ sugar/fat reduced cocoa powder/ milk protein/ emulsifiers	No	309	4.6	30	0.24
Cake	Go-ahead	Chocolate Dream Cake Bar	85% Fat Free	Sugar/reduced fat cocoa powder/ milk protein/filling/ emulsifiers	No	396	2.5	30	0.24
Cake	Go-ahead	Sticky Syrup & Fruit Cake Bar	97% Fat Free	Fruit/carrot/milk protein/sugar	No	284	2.1	30	0.24
Biscuit	Burtons	Trim Rich Tea	50% Reduced Fat	Emulsifiers	No	404	6.2	300	0.57
Biscuit	Vitalinea	Crispy Chocolate Flavoured Biscuits	84% Fat Free	Emulsifier/ flavouring	No	454	16.2	85	_
Biscuit	Vitalinea	Plum Fruit Bar	92% Fat Free	Fruit filling	No	370	7.5	150	0.89
Biscuit	Vitalinea	Chocolate Orange Fruit Bar	90% Fat Free	Fruit filling/ chocolate flavour/ emulsifier	No	382	9.7	150	1.09
Biscuit	Vitalinea	Light Crispy Teas	93% Fat Free	Sugar/ maize starch	No	411	6.7	100	0.39
Biscuit	Vitalinea	Cream Crackers	92% Fat Free	Emulsifiers	No	397	7.7	200	0.36
Biscuit	Vitalinea	Garlic & Black Pepper Crackers	93% Fat Free	Kibbled wheat/ malt flour/ flavouring	No	399	6.1	200	0.59
Biscuit	Go-ahead	Caramel Creams	85% Fat Free	Caramel filling in cream/ sugar / maltodextrin/ emulsifiers	No	452	13.9	150	0.59
Biscuit	Go-ahead	Strawberry Creams	85% Fat Free	Strawberry filling in cream/ sugar/ maltodextrins/ emulsifiers	No	451	13.9	150	0.59
Biscuit	Go-ahead	Fruit-Ins	95% Fat Free	Fruit filling/ maltodextrin/ flavourings	No	351	4.6	150	0.71

Product	Brand	Product	Fat Related Claim	Overview of Components Used to Achieve Fat Reduction	Full Fat	kCai/	Fat/	Weight	Cost
Category					Equivalent	100g	100g	(g)	£
Biscuit	Go-ahead	Crispy Fruit Slices	90% Fat Free	Fruit/ maltodextrin/flavourings	No	386	7.9	_	0.79
Biscuit	Go-ahead	Golden Crunch	90% Fat Free	Sugar/ flavourings	No	423	9.7	250	0.57
Biscuit	Go-ahead	Butter Crisp	90% Fat Free	Sugar/ emulsifiers/ flavourings	No	441	9.3	200	0.59
Biscuit	Go-ahead	Ginger crisp	90% Fat Free	Sugar/ emulsifiers/ flavourings	No	438	8.8	200	0.59
Biscuit	Go-ahead	Chocolinis	85% Fat Free	Sugar/ emulsifiers/ flavourings	No	466	14.7	250	0.87
Dessert	Go-ahead	Tropical Fruit Cheesecake	95% Fat Free	Low-fat digestive biscuits/ low fat soft cheese/fruit	No	206	3.8	520	2.29
Dessert	WeightWatchers	Tiramisu	Low Fat/ 95% Fat Free	Polydextrose/emulsfiers/gelatine/ stabilisers	No	181	3.7	145	1.29
Dessert	WeightWatchers	Blackcurrant Cheesecake	Low Fat/ 95% Fat Free	Fruit/ filling	No	159	4.1	200	1.29
Dessert	WeightWatchers	Toffee Chocolate	Low Fat/ 95% Fat Free	Emulsifiers/ Simplesse®	No	190	3.6	173	1.29
Dessert	WeightWatchers	Desserts Chocolate Cheesecakes	Low Fat/ 95% Fat Free	Emulsifiers/ Simplesse®	No	152	4.2	174	1.29
Dessert	M&S	Summerfruit Puddings	95% Fat Free	Fruit	No	90	0.2	260	2.69
Dessert	M&S	Raspberry/ Passionfruit Layered Dessert	95% Fat Free	Fruit	No	180	4.1	270	2.49

Table 2: Overview of Reduced-Fat / Low-Fat / % Fat Free Bakery Products Available in a Range of Supermarkets on 25.9.98, Together with Details of Their Full-Fat Counterparts

Product Category	Brand	Product	Fat Related Claim	Differences betweenModified-Fat Product Ingredient Declaration	Reduced- Fat Variety KCal/	Fat/	Weight	Cost	Full Fat	Full-Fat Variety kCal/	Fat/	Weight	Cos
				and Full-Fat Product Ingredient Declaration	100g	100g	(g)	£		100g	100g	(g)	£
Cake	Tesco	Reduced Fat Madeira Cake	33% less fat than standard Tesco all-butter Madeira	Increase sugar / reduced fat / use of emulsifiers	343	9.2	252	0.99	Yes	381	13.6	249	0.99
Cake	M&S	Orange/Lemo n Drizzle Cake	95% Fat free	Juice; emulsifiers; remove butter	305	1.9	176	1.39	Yes	390	14.8	175	1.39
Biscuit	Safeway	Digestive	25% reduced fat than standard Safeway digestive	Sugar/hydrogenated veg oil/ emulsifiers	469	16.6	400	0.49	Yes	498	22.6	400	0.52
Biscuit	Asda	Digestive	25% reduced fat than standard digestive biscuits	Decrease veg. oil; sugar/ emulsifiers	455	16	400	0.45	Yes	493	22.1	500	0.45
Biscuit	M&S	Digestive	25% less fat than standard M&S digestives	Increased sugar & raising agent/ emulsifiers	479	17.5	400	0.49	Yes	510	23.9	400	0.49
Biscuit	McVities	Digestive	25% reduced fat thanstandard McVities digestive	Sugar/emulsifiers	467	16.3	400	0.7	Yes	496	22.1	400	0.59
Biscuit	Sainsburys	Sweetmeal Digestive	25% less fat than Sainsbury's standard digestive biscuits	Sugar/oatmeal flour/emulsifiers	465	16.6	250	0.36	Yes	493	22.1	250	0.36
Biscuit	Tesco	Digestive Sweetmeal	25% less fat than standard Tesco digestive biscuits	Sugar/emulsifiers	460	15.3	400	0.45	Yes	482	22.5	400	0.47
Biscuit	Sainsburys	Rich Tea	25% less fat than Sainsbury's standard rich tea	Emulsifiers/soya lecithin	424	10.3	400	0.59	Yes	454	15.4	400	0.59
Biscuit	Tesco	Rich Tea	25% less fat than Tesco standard rich tea digestives	Emulsifiers	430	10.6	300	0.47	Yes	454	15.4	300	0.47
Biscuit	Tesco	Milk Chocolate Digestive	25% less fat than standard Tesco milk choc digestive	Increased sugar/emulsifiers	466	17.8	400	0.89	Yes	500	24.3	400	0.89
Biscuit	M&S	Milk Chocolate Digestive	25% less fat than standard M&S milk choc digestive	Increased sugar/ emulsifiers	482	18.3	300	0.85	Yes	520	25.7	300	0.85
Biscuit	Sainsburys	Milk Chocolate Digestive	25% less fat than standard Sainsbury's milk choc digestive	Increased sugar/emulsifiers	480	17.8	400	0.89	Yes	509	24.4	400	0.89
Biscuit	Asda	Milk Chocolate Digestive	25% less fat than standard chocolate digestive	1% increase in chocolate/increased sugar/emulsifiers	466	18	400	0.89	Yes	509	25	400	0.89
Biscuit	Sainsburys	Plain Chocolate Digestive	25% less fat than Sainsbury's standard plain choc digestive	increased sugar/reduced fat/ emulsifiers	478	17.8	400	0.89	Yes	509	24.4	400	0.89
Biscuit	McVities	Light plain Chocolate Digestive	25% less fat than original Homewheat	increased sugar/ emulsifiers	475	18	400	1.05	Yes	507	24.4	400	0.99
Biscuit	McVities	Plain Chocolate Digestive	25% less fat than standard chocolate digestives	increased sugar/ emulsifiers	475	18	400	1.05	Yes	507	24.4	400	0.99
Biscuit	Tesco	Custard Cream	25% less fat than standard Tesco custard cream	Increased sugar / emulsifiers	471	17.8	200	0.37	Yes	508	24.8	400	0.49
Biscuit	Asda	Custard Cream	25% less fat than standard custard cream	Emulsifiers/ raising agents	462	17	300	0.49	Yes	505	24.2	200	0.35
Biscuit	Sainsburys	ShortCake biscuits	25% less fat than Sainsbury's standard shortcake biscuits	Increased sugar/ emulsifiers/ cornflour	481	17.6	400	0.67	Yes	517	24.1	400	0.67

Product Category	Brand	Product	Fat Related Claim	Differences betweenModified-Fat Product Ingredient Declaration and Full-Fat	Reduced- Fat Variety KCal/	Fat/	Weight	Cost	Full Fat Equiv.	Full-Fat Variety kCal/	Fat/	Weight	Cos
				Product Ingredient Declaration	100g	100g	(g)	£		100g	100g	(g)	£
Biscuit	Vitalinea	Fig Rolls	92% fat free	No obvious changes	351	7.6	200	0.54	Yes	340	7.8	200	0.54
Dessert	Tesco	Mandarin Cheesecake	50% less fat than standard Tesco cheesecake	Sugar/fruit/lowfat digestive biscuits	206	4.8	550	1.99	Yes	_	_	_	-
Dessert	M&S	Asparagus Quiche	Reduced fat- total fat content 25% less than similar M&S product	Skimmed milk/ potato flour/ egg white	220	10.7	135	0.99	Yes	235	15.9	170	0.99
Biscuit	Weight Watchers	Stem ginger Cookies	40% less fat than Walker's ordinary stem ginger cookies	Increased sugar/ ginger/ oatflakes/ emulsifiers	399	13.4	138	0.75	Yes	-	23	_	_
Biscuit	Weight Watchers	Sultana & cinnamon cookies	40% less fat than Walker's ordinary sultana cookies	Fruit/ oatflakes/ flavouring	385	12.1	138	0.75	Yes	_	21	_	_
Biscuit	Weight Watchers	Dark treacle cookies	40% less fat than Walker's ordinary treacle cookies	Sugar/ treacle/ oatflakes	423	15.1	138	0.75	Yes	_	27	_	_