

The Summer Meeting of the Nutrition Society was held at the University of Reading on 4–6 July 2011

## 70th Anniversary Conference on ‘From plough through practice to policy’

### Symposium 2: Nutrition and health claims: help or hindrance European consumers and health claims: attitudes, understanding and purchasing behaviour

Josephine M. Wills<sup>1\*</sup>, Stefan Storcksdieck genannt Bonsmann<sup>1</sup>, Magdalena Kolka<sup>1</sup>  
and Klaus G. Grunert<sup>2</sup>

<sup>1</sup>European Food Information Council (EUFIC), Tassel House, Rue Paul Emile Janson 6, B-1000 Brussels, Belgium

<sup>2</sup>MAPP Centre for Research on Customer Relations in the Food Sector, Aarhus University, Haslegaardsvej 10,  
DK-8210 Aarhus V, Denmark

Health claims on food products are often used as a means to highlight scientifically proven health benefits associated with consuming those foods. But do consumers understand and trust health claims? This paper provides an overview of recent research on consumers and health claims including attitudes, understanding and purchasing behaviour. A majority of studies investigated selective product–claim combinations, with ambiguous findings apart from consumers’ self-reported generic interest in health claims. There are clear indications that consumer responses differ substantially according to the nature of carrier product, the type of health claim, functional ingredient used or a combination of these components. Health claims tend to be perceived more positively when linked to a product with an overall positive health image, whereas some studies demonstrate higher perceived credibility of products with general health claims (e.g. omega-3 and brain development) compared to disease risk reduction claims (e.g. bioactive peptides to reduce risk of heart disease), others report the opposite. Inconsistent evidence also exists on the correlation between having a positive attitude towards products with health claims and purchase intentions. Familiarity with the functional ingredient and/or its claimed health effect seems to result in a more favourable evaluation. Better nutritional knowledge, however, does not automatically lead to a positive attitude towards products carrying health messages. Legislation in the European Union requires that the claim is understood by the average consumer. As most studies on consumers’ understanding of health claims are based on subjective understanding, this remains an area for more investigation.

#### Health claims: Consumer behaviour: Attitude: Understanding: Purchasing

According to European Commission Regulation 1924/2006<sup>(1)</sup>, three types of claims are allowed to be made on foods throughout the European Union:

1. Nutrition claims, which state, suggest or imply that a food has particular beneficial properties due to its composition (regarding energy or a particular nutrient). Examples of this type of claim will be: ‘source of’, ‘free of’, ‘high’, ‘low’ or ‘reduced’ in energy or a particular nutrient.
2. Health claims, which state, suggest or imply that a relationship exists between a food or one of its components and health. This type of claim mentions the physiological function of a constituent such as

‘Calcium can help build strong bones’. The claim must be based on generally accepted scientific data and be well understood by the average consumer.

3. The third type are ‘disease risk factor reduction’ claims. They are a specific type of health claim, which state that a food or one of its components significantly reduces a risk factor for human disease. For example, phytosterols can help reduce blood cholesterol, thereby reducing a risk factor for CVD. For the first time, mention of disease will be allowed on food, but only after approval by the European Food Safety Authority.

The regulation requires that any claims promoting the nutrition and health benefits of a food are scientifically

\*Corresponding author: Josephine M. Wills, fax +32 2 506 89 80, email jo.wills@eufic.org

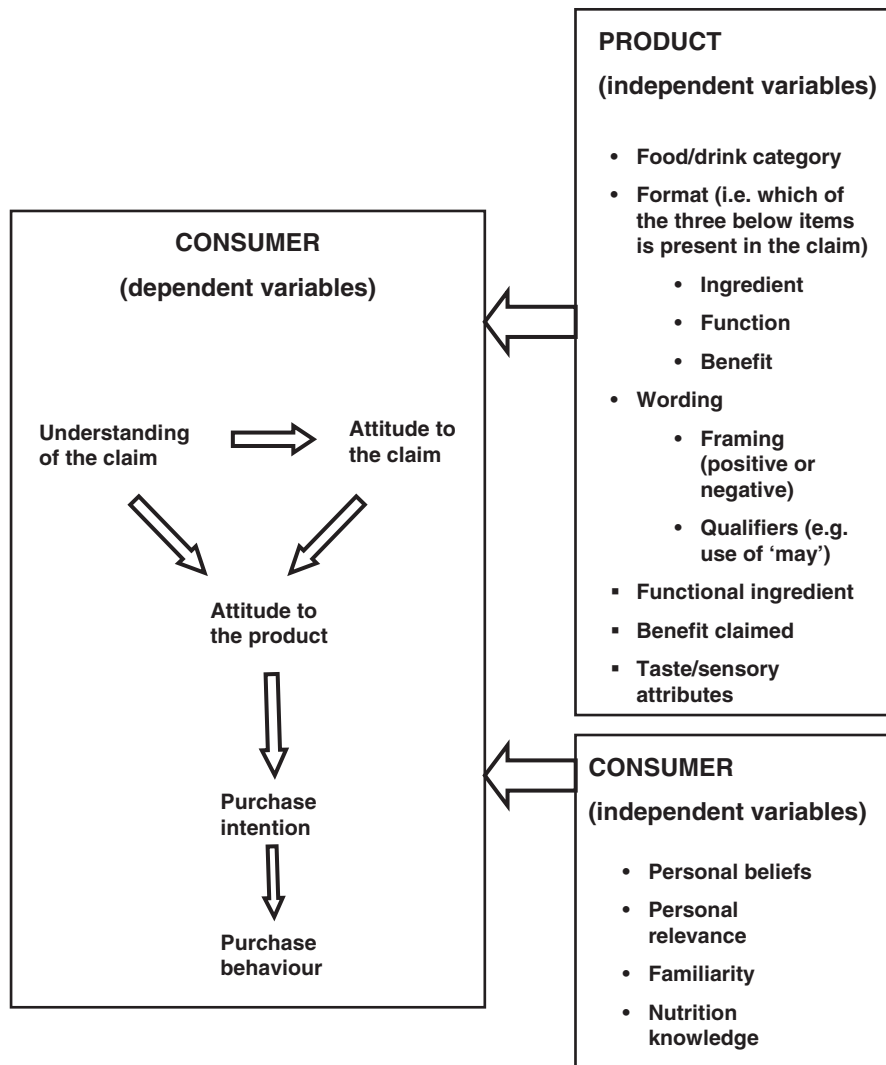


Fig. 1. Conceptual framework on how health claims affect consumers.

substantiated to help protect consumers from misleading claims. An essential aspect of the new legislation, laid down in Article 5.2, is the statement that 'the use of nutrition and health claims shall only be permitted if the average consumer can be expected to understand the beneficial effects as expressed in the claim'<sup>(1)</sup>.

People consider the healthfulness of food to be an important factor influencing their overall dietary choices<sup>(2,3)</sup>. Nutrition and health claims are used to highlight specific properties of foods that contain (added) beneficial ingredients or are lower in nutrients we should be eating less of. Some also view claims as a legitimate educational tool that will have a positive impact on consumer behaviour and nutrition awareness and as such contribute to public health<sup>(4)</sup>. However, taste<sup>(5-9)</sup>, brand and price<sup>(10)</sup>, attractiveness of the product<sup>(3,11)</sup> and packaging<sup>(8)</sup> seem to be more important than health claims in influencing purchasing decisions.

An audit of nutrition-related labelling on food and drink products from five product categories (sweet biscuits, breakfast cereals, pre-packed fresh ready meals, carbonated

soft drinks and yoghurts) revealed that the penetration of nutrition and health claims varies widely across the European Union<sup>(12)</sup>. Nutrition claims appeared front-of-pack on 25% of all products audited (range 12–37%) and back-of-pack on 20% of products (range 6–31%). In contrast, health claims (including disease risk reduction claims) were used much less often, and tended to appear back-of-pack (4%, range 1–8%) more than front-of-pack (2%, range 0–6%).

Various studies have investigated how consumers respond to health claims on food and drink products, addressing attitudes to health claims and the products carrying them, understanding of health claims as well as purchasing intentions for foods with health claims on. This paper presents a comprehensive overview of the state of research in these areas, following a conceptual framework specifically developed for this purpose (Fig. 1). It shows that, depending on whether and how consumers understand the health claim, they will develop an attitude to the claim, which in turn may affect the attitude to the product bearing the claim. Attitudes may affect purchase intentions and

ultimately purchasing behaviour. Understanding, attitudes and purchasing can be affected by both product and consumer variables. Product variables include the food/drink category, the format and wording of the health claim, the functional ingredient and benefit claimed, and taste and sensory attributes of the product. Consumer variables include personal beliefs not related to specific claims and products (e.g. about the usefulness of functional foods in general), personal relevance (e.g. due to health concerns or health problems), familiarity with functional ingredients or products containing them and nutrition knowledge. No study has investigated all of these effects, but we will use this model to structure our review of the literature. Throughout this review, it should be borne in mind that the comparability of findings is hampered both by differences in study methodology as well as large interindividual differences.

### Effects on consumer attitudes to claims and products bearing them: product-related variables

#### *Food/drink category*

There is a tendency for health claims to be perceived more positively when linked to products with an overall positive health image, e.g. yoghurt or bread<sup>(11,13–16)</sup>. Dutch<sup>(13)</sup> consumers reported health claims to be most attractive on yoghurt and brown bread and least attractive on meat replacer and chewing gum.

Whereas people thus view certain foods as more suitable than others to carry health claims<sup>(14)</sup> no consistency exists as to the most appropriate product categories. Health claims are not by default transferable across product categories, and naturally occurring combinations of functional ingredients and carrier products seem to be preferred<sup>(14,16–18)</sup>.

Furthermore, health claims on various carrier products performed differently in different countries in terms of perceived healthiness. Whereas respondents in Finland, Germany, Italy and the UK all preferred bread and yoghurt over cake as the carrier product, the perceived healthiness of bread scored higher in Germany and Finland than in the UK and Italy<sup>(19)</sup>.

The fact that people find health claims on certain products more acceptable than on others does not imply that the overall attitude to the product will become more positive due to the health claim. Several studies showed that products such as yoghurt<sup>(20)</sup>, juices<sup>(21,22)</sup>, honey<sup>(23)</sup> and low fat foods<sup>(5)</sup>, which tend to be perceived as being healthful *per se*, did not benefit from enrichment with a functional ingredient. On the other hand, certain products with a less 'healthful' image, e.g. candies, spreads<sup>(24)</sup> or mayonnaise<sup>(20)</sup>, were found to benefit from carrying health claims.

#### *Health claim format*

In addition to nutrition claims, there are two main formats of health claims regulated by European Commission Regulation 1924/2006<sup>(1)</sup>; general health claims and reduction

of disease risk claims. Health claims may differ in whether the functional ingredient is mentioned or not.

In general, the mere presence of a health claim has been found to increase the perceived healthiness of the product<sup>(5,14,25)</sup>, whereas the study by Lähteenmäki *et al.*<sup>(16)</sup> reported opposite findings. However, some evidence illustrates that reduction of disease risk claims have a stronger influence on perceived healthiness than general claims<sup>(13,19)</sup>. Saba *et al.*<sup>(19)</sup> compared products carrying health claims with the same products without claims (control products), and the presence of a reduction of disease risk claim had a positive influence on the perceived healthiness of that product. In another study by van Kleef *et al.*<sup>(13)</sup>, participants rated health claims relating to disease (heart disease, cancer and osteoporosis) as more attractive than claims related to mental health (stress) and appearance (youthfulness and skin protection). This pattern has been explained by the extent to which those health claims are personally relevant. For instance, a family history of cancer may lead to more positive attitudes towards health claims relating to this disease<sup>(13)</sup>.

Nevertheless, other studies have yielded contradictory results<sup>(22,26,27)</sup>. As general health claims tend to be shorter<sup>(28)</sup>, easier to understand and evoke positive associations from memory<sup>(29)</sup> they may be more likely to be preferred by consumers<sup>(4,26)</sup>. This might explain why some studies reported disease risk reduction claims to be perceived as less credible and less attractive than general health claims, as was the case for Belgian<sup>(22)</sup>, Irish<sup>(27)</sup> and Nordic<sup>(30)</sup> consumers.

Differences across countries as to which health claim format is preferred have been reported. Saba *et al.*<sup>(19)</sup> examined consumer attitudes towards products bearing health claims in Finland, Germany, Italy and the UK. The UK respondents preferred the general health claims over the disease risk reduction claims, whereas Finnish and German respondents preferred the opposite.

Another factor influencing the acceptance of the product is whether health claims mention the ingredient responsible for the benefit<sup>(21,31)</sup>. Consumers tend to regard claims referring to a specific substance as more convincing than claims which state that the product is generally healthy<sup>(8,32)</sup>. Verbeke *et al.*<sup>(22)</sup> compared the consumer perception of a claim that did not mention the functional ingredient responsible for the benefit with that of a health claim that did mention the functional ingredient. While reduction of disease risk claims lowered the credibility of the product, the reduction of disease risk in omega-3 enriched spread was well perceived.

Overall, the evidence on consumer reactions to the format of health claims is equivocal, as also noted in the reviews by Williams<sup>(4)</sup> and the UK Food Standards Agency<sup>(33)</sup>. In addition, a cross-national internet-based survey in Italy, Germany and the UK (also including the USA) indicated that consumer perceptions differ by country more substantially than by the claim format<sup>(25)</sup>.

#### *Wording of claims*

The terminology used in health claims is another factor shaping the extent to which consumers find health claims

attractive<sup>(26)</sup>. A previous review by Williams<sup>(4)</sup> concluded that consumers generally prefer short, succinct wording. However, Grunert *et al.*<sup>(30)</sup> reported results showing that two types of consumers can be distinguished, those who prefer short messages and those who prefer more detailed information on health claims. Another way to increase consumer acceptance of claims may be to split the claim into a succinct statement on the front of the package and more detailed information provided elsewhere on the package<sup>(4,28)</sup>.

Whether the claim is framed positively or negatively also may impact on consumers' reactions ('improves bone health' v. 'reduces risk of osteoporosis'), as does including a qualifier (e.g. 'may reduce' instead of 'reduces'), although the effects seem to be small<sup>(16,30)</sup>.

#### *Functional ingredient and benefit claimed*

The ingredient, the type of benefit claimed and the familiarity with both ingredient and benefit have a bigger impact on consumer attitude than the format and wording of the claim<sup>(12,27)</sup>. When a health benefit is well known, e.g. Ca and osteoporosis (compared to e.g. K and hypertension), acceptance of the health claim is stronger, and the format of the health claim has no bearing on how strongly consumers believe in the promoted benefit<sup>(13)</sup>. Also here, cross-national differences exist. This is well illustrated by Jesionkowska *et al.*<sup>(21)</sup>, who examined consumer attitudes to dried fruit as a carrier of various functional ingredients. This study involved Dutch, French and Polish consumers, and differences were found for both the ingredient used and the benefit claimed. Dutch respondents appreciated the presence of fibre most highly, whereas Polish consumers valued the content of vitamins most. Products that lowered the risk of cancer or heart diseases were mainly of interest to Dutch (54.8%) and Polish (45.9%) respondents, whereas French consumers in addition emphasised interest in the prevention of intestinal problems. Likewise, a cross-national internet-based survey in Italy, Germany and the UK (also including the USA) indicated that consumer perceptions differ by both country and by benefit being claimed<sup>(25)</sup>. For instance, German consumers rated the weight-control benefits higher than cardiovascular and fatigue benefits. In Italy, immunity-related benefits and in Germany, anti-fatigue benefits scored highest in terms of perceived overall healthiness. This shows that although one of the factors affecting consumer responses to health claims is the benefit being claimed; this is further influenced by the respondent's nationality and it varies across different dimensions such as perceived naturalness, healthiness and appeal.

In addition, the familiarity of the functional ingredient plays a role. This was indicated in the Scandinavian ACCLAIM (Consumer acceptance and trust: Recommendation for using health related claims in marketing) project, where the acceptability of a claim was higher for 'omega-3' (considered well known) compared to the rather unfamiliar ingredient 'bioactive peptides'<sup>(16,30)</sup>. Familiarity with the ingredient also increased product appeal in another study<sup>(26)</sup>.

#### *Taste/sensory attributes*

Another factor influencing the reactions towards products with health claims on is taste preference. It has been found that hedonic reasons are more important factors affecting willingness to try foods bearing health claims than the perceived healthiness of that product<sup>(5-7,9)</sup>. This is in line with other studies where consumers have reported no willingness to compromise taste for health in functional foods<sup>(34)</sup>. In addition, some of those studies showed that health claims might even have a negative impact on product acceptance, if an unpleasant tasting experience is also reported<sup>(5,6,9,16)</sup>. This points to the primary role of taste in driving consumer food choice in general. Nevertheless, Sabbe *et al.*<sup>(6)</sup> found that individuals with a general interest in health are to some extent willing to compromise taste for the promised health benefit.

The earlier review gives clear evidence that product attributes can affect consumer reactions towards health claims and towards the products bearing them. Moreover, some of these attributes were found to be more influential than others, especially the nature of the carrier product<sup>(5,23)</sup> and the health benefit claimed<sup>(13,27)</sup>. These determinants vary by country.

#### **Effects on consumer attitudes to claims and products bearing them: consumer-related variables**

##### *Personal beliefs*

In addition to product attributes, consumer characteristics also determine consumer responses to health claims. In a study by Verbeke *et al.*<sup>(22)</sup>, the general attitude towards foods with health benefits had the strongest positive effect on how positively the health claims were rated. This has been termed the 'congruence with own beliefs' effect<sup>(16,21)</sup>. Consumer belief in the positive link between diet and health may be important in shaping demand for functional food products.

##### *Personal relevance*

Claims that address a topic that is of personal relevance have more consumer appeal<sup>(13,14,22,35)</sup>. It has been illustrated that individuals tend to have a more positive attitude and increased acceptance of food products with health claims when a relative or friend is affected by the related condition<sup>(8,33)</sup>. A study in Finland<sup>(36)</sup> found that people who are interested in their health in general also express more interest in foods promising additional benefits.

In a study by Dean *et al.*<sup>(14)</sup>, the self-reported need to pay attention to health was the most important factor affecting how people see the particular product bearing the health claim. Those who reported to feel a need to watch their health saw more benefits in all the products tested than those with less need to look after their health, thus indicating that perceived susceptibility to illness and personal relevance play a significant role in the perception of foods with health claims.

Consumers who do not appreciate the impact of their diet on health will consequently be more negative with

regard to functional foods<sup>(8)</sup>. In other words, health status does not necessarily lead to a belief about the relevance of functional foods. However, it should be borne in mind that self-reported need to pay attention to health and objectively defined health status as assessed by a physician are two very different starting points that do not necessarily correlate.

Overall, female gender, a general interest in health and higher socio-economic status tended to enhance personal relevance and thus lead to more favourable attitudes towards health claims<sup>(6,20,26)</sup>.

#### *Familiarity and experience*

Consumer acceptance of products with health claims may depend on familiarity and previous experience with the functional ingredient<sup>(16)</sup>, the health claim itself, the specific phrases that are being used in the claim<sup>(22,26,37–39)</sup>, and finally the functional food product itself. In a study by Verbeke *et al.*<sup>(22)</sup> on consumer appeal of nutrition and health claims among Belgian consumers, previous experience boosted all ratings. Those participants who had used the product before, found claims and products more convincing, credible, attractive and also expressed higher intention to use them in the future. Therefore, it has been suggested that repeated exposure to health information and hence knowledge about the functional food can increase product liking<sup>(40)</sup>. For instance, ‘omega-3’ as a well-known ingredient increased convincingness of the functional food compared to unknown ‘bioactive peptides’<sup>(16)</sup>. This might be due to extensive marketing promotion and communication efforts, which could have built a healthy reputation of the omega-3 concept in recent years<sup>(22)</sup>. This is in agreement with the review by Williams<sup>(4)</sup> who found that the credibility of health messages also increases when they are repeated frequently by different and trusted sources.

#### *Nutrition knowledge*

Evidence of the impact of nutrition knowledge on consumer attitudes towards health claims and the corresponding carrier products is contradictory. Lack of nutrition knowledge was suggested by Ares *et al.*<sup>(20)</sup> to limit consumers’ abilities to understand or evaluate a health claim, thus leading to lower perceived credibility of those claims. In this study, the addition of fibre or antioxidants to certain products increased the interest of consumers with the highest level of nutrition knowledge to try these functional foods. In turn, a lack of nutrition knowledge might limit the acceptance of functional foods, yet Lalor *et al.*<sup>(35)</sup> observed that higher levels of nutrition knowledge led to less trust in health claims.

#### **Effects on understanding of claims**

With regard to general consumer understanding of health claims, data are scarce. Recent studies that provide some insight into consumers’ understanding of health claims are those by van Trijp and van der Lans<sup>(25)</sup> and Grunert *et al.*<sup>(41)</sup>. The former is about subjective understanding, i.e. how easy or difficult consumers perceive the claim to be

understood, whereas the latter is on objective understanding, i.e. whether consumer understanding was in accordance with the scientific dossier on the claim.

The study by van Trijp and van der Lans<sup>(25)</sup> was undertaken in four countries (UK, Italy, Germany and USA), involved a relatively big sample size ( $n$  6367) and used thirty different combinations of health claims. Five different types of claims were tested: (i) nutrient content claim, (ii) function claim, (iii) disease risk reduction claim, (iv) taste claim and (v) marketing claim. Moreover, each respondent had to evaluate two different health claims (both with respect to benefit and claim type). In all four countries, health claims were perceived to be moderately new, and somewhat difficult to understand. The understanding differed among various health claim types and types of benefits being used (five types of health claims used). Respondents reported the function claim the most difficult to understand. Overall, consumer understanding was influenced by several variables, such as knowledge about the claim or the substance in the claim, familiarity with the product and the claim and terminology used, and respondent’s country of origin. These findings are in line with the review by Williams<sup>(4)</sup>.

In the study by Grunert *et al.*<sup>(41)</sup>, the understanding of a health claim on yoghurt was measured using open questions after exposure to the claim (sample of 720 Germans). Participants’ claim understanding was classified as safe (answers matched the scientific dossier), risky (answers not in line with the scientific dossier) or other (answers expressed a vague notion or an expression that was irrelevant). Individuals with a positive view of functional foods were more likely to think the product was even more beneficial than could reasonably be expected (‘risky’ consumers). On the other hand, consumers with negative or neutral reactions towards health claims tended to fall into the category ‘Other’. These findings invalidated the authors’ hypothesis that respondents with higher motivation also have better knowledge on health claims and make more correct inferences.

The findings of Grunert *et al.*<sup>(41)</sup> show that individuals may generalise messages in health claims from one benefit to another, which is called a ‘magic bullet’ effect, or they perceive the products as generally superior, which is referred to as a ‘halo effect’<sup>(16)</sup>. As health claims provide information only on health-related benefits, they should only influence the perception of health-related product attributes. Leathwood *et al.*<sup>(42)</sup> also described processes through which health benefits may produce a ‘more positive’ response than the aim of the health message. This tendency to infer from claims unjustified qualities in other product attributes is in agreement with a previous review by Williams<sup>(4)</sup>. However, the research undertaken by Lähteenmäki *et al.*<sup>(16)</sup> reported no positive halo effect of health claims on other product attributes; on the contrary, perceived influences tended to be negative.

In summary, studies have provided evidence that people do not always understand health and nutrition claims as they are intended<sup>(22,41,42)</sup>. However, there is limited quantitative information available on the proportion of consumers who correctly understand claims already in use, making it difficult to set targets for adequate levels of

consumer understanding. Therefore, research is required to establish expected plausible benchmark proportions. Leathwood *et al.*<sup>(42)</sup> explored a range of various methodologies used for assessing consumer understanding of health claims. It was concluded that a combination of qualitative and quantitative research should fulfil the requirements needed to establish that particular health claims are understood by a majority of consumers. However, there is a huge need for more research on consumer understanding of health claims.

### Effects on purchase behaviour

Health is an important buying motive and nutrition and health claims can have a positive impact on purchasing behaviour<sup>(43)</sup>. Since health claims can increase the perceived healthiness of a product<sup>(5,19,22,44)</sup>, some studies looked at the impact of health claims on buying intentions, with different results. Whereas some researchers reported very high correlations between people's perceived healthiness of products with health claims and their willingness to buy these products<sup>(13,14,45)</sup>, other researchers failed to find such a link<sup>(19,22)</sup>. Some even reported lower credibility and intention to purchase for products bearing reduction of disease risk claims<sup>(22)</sup>.

#### *Food/drink category and health claim format*

Not only does the food/drink category affect consumer attitudes towards health claims, but also it can be expected to partly influence consumers' intentions to purchase products bearing health claims (Fig. 1). Grunert *et al.*<sup>(30)</sup> found that consumers were more willing to buy bread enriched with omega-3, than pork chops fortified with this ingredient. Two European studies have investigated the influence of claim format on purchase behaviour/willingness to try products carrying health claims<sup>(19,26)</sup>, with equivocal results. In the study by Saba *et al.*<sup>(19)</sup> the presence of health claims, regardless of the format (general or disease risk), was found to have no influence on likelihood to buy the product. Ares *et al.*<sup>(26)</sup>, on the other hand, observed that both formats had a positive impact on the perceived healthfulness of the product (milk dessert) and respondents' willingness to try it compared to the product without a claim.

#### *Other product attributes*

Perceiving a food product as healthier does not necessarily result in the consumer purchasing the product<sup>(20)</sup>. This implies that health claims may not play as vital a role in influencing purchasing decisions as taste<sup>(5-9)</sup>, brand and price<sup>(10)</sup>, attractiveness of the product<sup>(3,11)</sup> and packaging<sup>(8)</sup>. Furthermore, the study by Ares *et al.*<sup>(10)</sup> found that the brand name had the greatest impact on buying food with health claims. They recognised two different types of people: the first group was willing to sacrifice liking for health and considered the brand and the type of enrichment equally important, and price and claim type are least relevant; the second group would not sacrifice taste for health and considered brand the most important attribute followed

by the type of enrichment, then price and finally the type of health claim.

Other explanatory factors include: buying from habit<sup>(8)</sup> and no tendency to read labels and/or lack of understanding of the information being read<sup>(46)</sup>. In addition, physico-chemical properties of the food may influence whether the health claim on food products is accepted or not<sup>(8)</sup>. Therefore, it can be concluded that at the point of sale there are other factors that might have a much greater combined influence on purchase behaviour than the health claim-related determinants analysed in most of the studies<sup>(44)</sup>.

#### *Personal relevance and familiarity*

Personal relevance (health enhancement and health risk prevention through appropriate dietary choices) was found as the most important motive for functional food purchases in a study by Krystallis *et al.*<sup>(3)</sup>. The authors suggested that health-enhanced foods should bring their health benefits above and beyond the high perceived quality that is vital to consumers.

### Limitations of studies cited

There is a wide range of determinants that can have an impact on consumers' reactions towards health claims (partly summarised in Fig. 1), and most studies have investigated only a few of them. Furthermore, a majority of studies investigated selective claim-product combinations<sup>(13,33)</sup> or focused only on the format of the health claim itself<sup>(43)</sup>. Hence, the number of studies that investigated consumer perceptions across a wide range of different health benefits and claim types is limited<sup>(4,25)</sup>. The findings are not easily comparable, as the methodologies and research designs employed vary greatly. Furthermore, there is a lack of studies measuring actual consumer behaviour, as many studies relied on self-reported data. In addition, different combinations of products, claims and functional ingredients were used across studies, making it difficult to derive a clear picture.

### Conclusion

Studies show that the acceptance of products with health claims is influenced by many different factors. Familiarity with the product, health claim or functional ingredient used plus personal relevance (Fig. 1) appear as the most important determinants. The choice of carrier product can determine to what extent people trust a health claim or are willing to try the respective product. Furthermore, consumers like simple wording, but they may also demand detailed explanations.

However, more research is needed into consumer understanding of health claims in order to maximise the potential for functional foods to contribute to healthy, balanced diets.

### Acknowledgements

The European Food Information Council receives some funding from companies in the European Food and Drink industry. However, no companies were consulted in the drafting of this review, and there are no conflicts of interest. K. G. G. declares no conflict of interests. J. W. devised the structure of the literature review, presented the results at the UK Nutrition Society Summer Meeting and critically reviewed the manuscript. S. S. G. B. provided input on the structure, helped with the literature search and carried out major revisions of the draft manuscript. M. K. carried out the literature review and wrote the first draft of the manuscript. K. G. G. devised the theoretical framework and critically reviewed the manuscript.

### References

- European Commission (2006) Regulation (EC) No. 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods. *Off J Eur Union L* **404**, 3–18.
- Grunert KG (2005) Food quality and safety: Consumer perception and demand. *Eur Rev Agric Econ* **32**, 369–391.
- Krystallis A, Maglaras G & Mamalis S (2008) Motivations and cognitive structures of consumers in their purchasing of functional foods. *Food Qual Prefer* **19**, 525–538.
- Williams P (2005) Consumer understanding and use of health claims for foods. *Nutr Rev* **63**, 256–264.
- Lyly M, Roininen K, Honkapää K *et al.* (2007) Factors influencing consumers' willingness to use beverages and ready-to-eat frozen soups containing oat beta-glucan in Finland, France and Sweden. *Food Qual Prefer* **18**, 242–255.
- Sabbe S, Verbeke W, Deliza R *et al.* (2009) Effect of a health claim and personal characteristics on consumer acceptance of fruit juices with different concentrations of açai (*Euterpe oleracea* Mart.). *Appetite* **53**, 84–92.
- Miele NA, Di Monaco R, Cavella S *et al.* (2010) Effect of meal accompaniments on the acceptability of a walnut oil-enriched mayonnaise with and without a health claim. *Food Qual Prefer* **21**, 470–477.
- Lalor F, Madden C, McKenzie K *et al.* (2011) Health claims on foodstuffs: A focus group study of consumer attitudes. *J Funct Foods* **3**, 56–59.
- Vidigal MCTR, Minim VPR, Carvalho NB *et al.* (2011) Effect of a health claim on consumer acceptance of exotic Brazilian fruit juices: Açai (*Euterpe oleracea* Mart.), camucamu (*Myrciaria dubia*), cajá (*Spondias lutea* L.) and umbu (*Spondias tuberosa* Arruda). *Food Res Int* **44**, 1988–1996.
- Ares G, Giménez A & Deliza R (2010) Influence of three non-sensory factors on consumer choice of functional yogurts over regular ones. *Food Qual Prefer* **21**, 361–367.
- Siegrist M, Stampfli N & Kastenholz H (2008) Consumers' willingness to buy functional foods. The influence of carrier, benefit and trust. *Appetite* **51**, 526–529.
- Storcksdieck genannt Bonsmann S, Celemin LF, Larranaga A *et al.* (2010) Penetration of nutrition information on food labels across the EU-27 plus Turkey. *Eur J Clin Nutr* **64**, 1379–1385.
- van Kleef E, van Trijp HC & Luning P (2005) Functional foods: Health claim-food product compatibility and the impact of health claim framing on consumer evaluation. *Appetite* **44**, 299–308.
- Dean M, Shepherd R, Arvola A *et al.* (2007) Consumer perceptions of healthy cereal products and production methods. *J Cereal Sci* **46**, 188–196.
- Kavanagh G, Lalor F, Kennedy J *et al.* (2008) Health psychology and consumers' perception of claims on food. *Proc Nutr Soc* **67**, E269.
- Lähteenmäki L, Lampila P, Grunert K *et al.* (2010) Impact of health-related claims on the perception of other product attributes. *Food Policy* **35**, 230–239.
- Teratanavat R & Hooker NH (2006) Consumer valuations and preference heterogeneity for a novel functional food. *J Food Sci* **71**, S533–S541.
- Krutulyte R, Grunert KG, Scholderer J *et al.* (2011) Perceived fit of different combinations of carriers and functional ingredients and its effect on purchase intention. *Food Qual Prefer* **22**, 11.
- Saba A, Vassallo M, Shepherd R *et al.* (2010) Country-wise differences in perception of health-related messages in cereal-based food products. *Food Qual Prefer* **21**, 385–393.
- Ares G, Gimenez A & Gambaro A (2008) Influence of nutritional knowledge on perceived healthiness and willingness to try functional foods. *Appetite* **51**, 663–668.
- Jesionkowska K, Sijtsema SJ, Konopacka D *et al.* (2009) Dried fruit and its functional properties from a consumer's point of view. *J Horticult Sci Biotechnol* **84**, 85–88.
- Verbeke W, Scholderer J & Lähteenmäki L (2009) Consumer appeal of nutrition and health claims in three existing product concepts. *Appetite* **52**, 684–692.
- Ares G & Gambaro A (2007) Influence of gender, age and motives underlying food choice on perceived healthiness and willingness to try functional foods. *Appetite* **49**, 148–158.
- Barreiro-Hurle J, Gracia A & De-Magistris T (2010) The Effects of Multiple Health and Nutrition Labels on Consumer Food Choices. *J Agric Econ* **61**, 426–443.
- van Trijp HC & van der Lans IA (2007). Consumer perceptions of nutrition and health claims. *Appetite* **48**, 305–324.
- Ares G, Giménez A & Gambaro A (2009) Consumer perceived healthiness and willingness to try functional milk desserts. Influence of ingredient, ingredient name and health claim. *Food Qual Prefer* **20**, 50–56.
- Lynam A-M, McKeivitt A & Gibney MJ (2011) Irish consumers' use and perception of nutrition and health claims. *Public Health Nutr* **14**(12), 2213–2219.
- Kapsak WR, Schmidt D, Childs NM *et al.* (2008) Consumer perceptions of graded, graphic and text label presentations for qualified health claims. *Crit Rev Food Sci Nutr* **48**, 248–256.
- Francel S (2009) Are health claims understood? MSc Thesis, Open University, Zoetermeer.
- Grunert KG, Lähteenmäki L, Boztug Y *et al.* (2009) Perception of health claims among nordic consumers. *J Consum Policy* **32**, 269–287.
- Hasler CM (2008) Health claims in the United States: An aid to the public or a source of confusion? *J Nutr* **138**, 1216S–1220S.
- Aschemann-Witzel J & Hamm U (2010) Do consumers prefer foods with nutrition and health claims? Results of a purchase simulation. *J Market Commun* **16**, 47–58.
- Food Standards Agency (2009) *An Evidence Review of Public Attitudes to Emerging Food Technologies*. London: Food Standards Agency.
- Verbeke W (2006) Functional foods: Consumer willingness to compromise on taste for health? *Food Qual Prefer* **17**, 126–131.
- Lalor F, Kennedy J & Wall P (2009) The impact, among third-level students, of nutrition knowledge on behaviour

- towards products with health claims. *Proc Nutr Soc* **68**, E131.
36. Urala N (2005) Functional Foods in Finland – Consumers' Views, Attitudes and Willingness to Use. Helsinki: University of Helsinki.
  37. Stojanovic Z, Dragutinovic-Mitrovic R & Ognjanov G (2010) Health claimed products and consumer attitudes in Balkan countries. Paper presented at European Federation of Animal Science 61st Annual Meeting, Heraklion, 2010. Available at: [http://www.eaap.org/Previous\\_Annual\\_Meetings/.../41\\_stojanovic.pdf](http://www.eaap.org/Previous_Annual_Meetings/.../41_stojanovic.pdf) (accessed February 2012).
  38. Binns N & Howlett J (2009) Functional foods in Europe: International Developments in Science and Health Claims: Summary report of an International Symposium held 9–11 May 2007, Portomaso, Malta. *Eur J Nutr* **48**, Suppl. 1, S3–S13.
  39. Verbeke W (2010) Consumer reactions to foods with nutrition and health claims. *AgroFood Ind Hi-Tech* **21**, 5–8.
  40. Landstrom E, Sidenvall B, Koivisto Hursti UK *et al.* (2007) Health-care professionals' perceived trust in and willingness to recommend functional foods: A qualitative study. *Appetite* **48**, 241–247.
  41. Grunert KG, Scholderer J & Rogeaux M (2011) Determinants of consumer understanding of health claims. *Appetite* **56**, 269–277.
  42. Leathwood PD, Richardson DP, Strater P *et al.* (2007) Consumer understanding of nutrition and health claims: Sources of evidence. *Br J Nutr* **98**, 474–484.
  43. Food Standards Agency (2007) *Review and Analysis of Current Literature on Consumer Understanding of Nutrition and Health Claims Made on Food*. London: Food Standards Agency.
  44. Aschemann J & Hamm U. (2008) Determinants of Choice Regarding Food with Nutrition and Health Claims: 2008 International Congress, August 26–29, 2008, Ghent, Belgium, European Association of Agricultural Economists.
  45. BEUC (2005) *Report on European Consumers' Perception of Foodstuffs Labelling*. Brussels: BEUC, p. 16.
  46. Pothoulaki M & Chrysoschoidis G (2009) Health claims: Consumers' matters. *J Funct Foods* **1**, 222–228.