Appetite 51 (2008) 456–467

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Research review

Functional food. Product development, marketing and consumer acceptance—A review

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ARTICLE INFO

Article history:
Received 2 March 2008
Received in revised form 21 May 2008
Accepted 27 May 2008

Keywords:
Functional food
Market
Product development
Consumer acceptance
Probiotics
Prebiotics

ABSTRACT

It was mainly the advances in understanding the relationship between nutrition and health that resulted in the development of the concept of functional foods, which means a practical and new approach to achieve optimal health status by promoting the state of well-being and possibly reducing the risk of disease.

Functional foods are found virtually in all food categories, however products are not homogeneously scattered over all segments of the growing market. The development and commerce of these products is rather complex, expensive and risky, as special requirements should be answered. Besides potential technological obstacles, legislative aspects, as well as consumer demands need to be taken into consideration when developing functional food. In particular, consumer acceptance has been recognized as a key factor to successfully negotiate market opportunities.

This paper offers a brief overview of the current functional food market situation in USA, Japan and some European countries completed with some comments on functional food future potential. It explores the main challenges of such product development focusing on the different factors determining the acceptance of functional food. Furthermore it discusses some prominent types of these food products currently on the market.

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doi:10.1016/j.appet.2008.05.060

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Introduction

In the last decades consumer demands in the field of food production has changed considerably. Consumers more and more believe that foods contribute directly to their health (Mollet & Rowland, 2002; Young, 2000). Today foods are not intended to only satisfy hunger and to provide necessary nutrients for humans but also to prevent nutrition-related diseases and improve physical and mental well-being of the consumers (Menrad, 2003; Roberfroid, 2000b). In this regard, functional foods play an outstanding role. The increasing demand on such foods can be explained by the increasing cost of healthcare, the steady increase in life expectancy, and the desire of older people for improved quality of their later years (Kotilainen, Rajalahti, Ragasa, & Pehu, 2006; Roberfroid, 2000a, 2000b).

The term "functional food" itself was first used in Japan, in the 1980s, for food products fortified with special constituents that possess advantageous physiological effects (Hardy, 2000; Kwak & Jukes, 2001a; Stanton, Ross, Fitzgerald, & Van Sinderen, 2005). Functional foods may improve the general conditions of the body (e.g. pre- and probiotics), decrease the risk of some diseases (e.g. cholesterol-lowering products), and could even be used for curing some illnesses. It was recognized that there is a demand for these products as different demographical studies revealed that the medical service of the aging population is rather expensive (Mark-Herbert, 2004; Menrad, 2003; Side, 2006).

The concept of functional food was first promoted in 1984 by Japanese scientists who studied the relationships between nutrition, sensory satisfaction, fortification and modulation of physiological systems. In 1991, the Ministry of Health introduced rules for approval of a specific health-related food category called FOSHU (*FO*od for *S*pecified *H*ealth *U*ses) which included the establishment of specific health claims for this type of food (Burdock, Carabin, & Griffiths, 2006; Kwak & Jukes, 2001a; Menrad, 2003; Roberfroid, 2000b).

There is no doubt that the Japanese interest in functional foods has also brought awareness for the need of such products in places like Europe and the United States. Experts in these countries realized that besides being able to lower the cost of healthcare of the aging population, functional food might also give a commercial potential for the food industry. Eastern and Western cultures however, diverge considerably with regard to the nature of functional foods. In Japan, for example, traditional functional food tends to be regarded as a distinct class of product, which means that after approval a "FOSHU" symbol can be displayed on the food label. In the case of such products (often referred as first generation functional foods), function is superior compared to taste. In Europe and USA, the question is more about a concept—functional food means adding functionality to an existing traditional food product (often a mainstream product), and such food products do not create a separate group (Fern, 2007; Hilliam, 1998; Kotilainen et al., 2006).

Definition of functional food

Typically, a food marketed as functional contains added, technologically developed ingredients with a specific health benefit (Niva, 2007). Although the term "functional food" has already been defined several times (Roberfroid, 2002), so far there is no unitary accepted definition for this group of food (Alzamora et al., 2005). In most countries there is no legislative definition of the term and drawing a border line between conventional and functional foods is challenging even for nutrition and food experts (Mark-Herbert, 2004; Niva, 2007). To date, a number of national authorities, academic bodies and the industry have proposed definitions for functional foods. These ranges from the very simple to the more complex; "Foods that may provide health benefits beyond basic nutrition" and "Food similar in appearance to conventional food that is intended to be consumed as part of a normal diet, but has been modified to subserve physiological roles beyond the provision of simple nutrient requirements" are good examples for the two approaches (Bech-Larsen & Grunert, 2003).

The European Commission's Concerted Action on Functional Food Science in Europe (FuFoSE), coordinated by International Life Science Institute (ILSI) Europe defined functional food as follows: "a food product can only be considered functional if together with the basic nutritional impact it has beneficial effects on one or more functions of the human organism thus either improving the general and physical conditions or/and decreasing the risk of the evolution of diseases. The amount of intake and form of the functional food should be as it is normally expected for dietary purposes. Therefore, it could not be in the form of pill or capsule just as normal food form" (Diplock et al., 1999). On the contrary to this latter statement, since 2001 FOSHU products in Japan can also take the form of capsules and tablets, although a great majority of products are still in more conventional forms (Ohama, Ikeda, & Moriyama, 2006).

European legislation however, does not consider functional foods as specific food categories, but rather a concept (Coppens, Fernandes Da Silva, & Pettman, 2006; Stanton et al., 2005). Therefore, the rules to be applied are numerous and depend on the nature of the foodstuff. The General Food Law Regulation is applicable to all foods. In addition, legislation on dietetic food, genetically modified organism (GMO), food supplements or on novel foods may also be applicable to functional foods depending on the nature of the product and on their use. In the EU, rather than regulating the product group per se, legislative efforts currently being developed are directed towards restricting the use of health claims on packages and in marketing (EC, 2006; Niva, 2007). According to the EU regulation on nutrition and health claims made on foods (EC No. 1924/2006), a list of authorised claims has to be published for all member states, and nutrient profiles also has to be established for foods containing health claims. Health claims can be "function claims" and "reduction of disease risk claims". Detailed aspects of relevant legislation is thoroughly discussed for example by Coppens et al. (2006), Asp (2007) and Mathioudakis (2007). Kwak and Jukes (2001a, 2001b) examined the regulatory concept of functional food in several countries including Japan, Korea, UK, USA and Australia. Legislations in other countries, for example in China (Lähteenmäki-Uutela, 2007) or in USA (Bagchi, 2006) are also discussed elsewhere.

The market of functional foods

As it has already been mentioned, it is not clearly defined which foods are considered as functional. Therefore, it is rather difficult to

estimate the market of these products and depending on whether a broader or a more specific definition is applied various data might come out (Kotilainen et al., 2006). Based on a definition of functional food by which ingredients with an additional health-value have been added to foods (and this is announced to the consumers), the global market of functional food is estimated to at least 33 billion[1] US$ (Hilliam, 2000b). Other experts like Sloan (2000, 2002) has reckoned the global functional food market to be 47.6 billion US$, being the United States the largest market segment, followed by Europe and Japan. Some estimations report even more global market value (nearly 61 billion US$) (Benkouider, 2004). The three dominant markets contribute over 90% of the total sales (Benkouider, 2005b).

The most important and dynamic market represents the USA with an estimated market share of more than 50%. In total, functional food have a market share of around 2–3% in the US food market (Menrad, 2003), and this percentage is expected to be doubled by 2008 (Benkouider, 2004). This growth can be explained by the fact, that the legislative framework was, and still is more favourable than in Europe (Hilliam, 1998; Side, 2006). According to Datamonitor predictions, the US market is likely to reach 25 billion US$ by the year of 2009 (Side, 2006).

It is not surprising that in Japan, regarded as the birthplace of functional food, the market of these products is significant (Hilliam, 2000b). In total, more than 1700 functional food products have been launched in Japan between 1988 and 1998 with an estimated turnover of around 14 billion US$ in 1999 (Menrad, 2003). The market was estimated to be 5 billion US$ in 2003 (Side, 2006) and 5.73 billion US$ in 2006, while more than 500 products were labelled as FOSHU in 2005 (Fern, 2007; Side, 2006).

The European market for functional foods was estimated to be between 4 and 8 billion US$ in 2003 depending which foods are regarded as functional (Menrad, 2003). This value has increased to around 15 billion US$ by 2006 (Kotilainen et al., 2006). The current market share of functional food is still below 1% of the total food and drink market. Germany, France, the United Kingdom and the Netherlands represent the most important countries within the functional food market in Europe (Mäkinen-Aakula, 2006). According to the latest research from Euromonitor International, the Dutch market for fortified and functional foods surpassed the 384.27 million US$ in 2004, making the Netherlands the sixth largest market of functional food products in Europe (Benkouider, 2005a). Euromonitor predicted that value sales for functional foods will rise moderately from 2005 to 2009 in the newly emerging markets of Hungary, Poland and Russia (Benkouider, 2005b). Although these markets are still undeveloped, numerous new products have been introduced in the last few years. Furthermore, the demand for functional foods is high in these countries, especially among the higher income population. The value of Russian functional food market, for example, was estimated at 75 million US$ in 2004, and an annual growth of 20% is expected (Kotilainen et al., 2006). Functional food market in 2006 represented approximately 17% of the total food market in Spain; moreover the predicted value for 2020 is around 40%. More than 50% growth was reported between 2000 and 2005 (Monár, 2007).

It should be emphasized however, that the European market is heterogeneous, and there are large regional differences in use and acceptance of functional foods; in general, the interest of consumers in functional food in the Central and Northern European countries is higher than in Mediterranean countries, where consumers have appreciated natural, fresh foods and consider them better for health (Menrad, 2003; Van Trijp, 2007).

[1] Here and later billion refers to 10^{12}.

Main type of suppliers

In general the total cost of developing a conventional new food product is estimated to be up by 1 or 2 million US$, while the development and marketing costs of functional food products may exceed this level by far. In addition to resources and know-how in nutritional and food technology research, the proof of efficacy of functional food products requires knowledge in the medical field as well. To fulfill the strict requirements of scientific verification of the efficacy of functional food, statistically validated data from different model systems, from retrospective and prospective epidemiological studies, as well as from intervention studies on humans need to be presented (Menrad, 2003).

Arising directly from the above is that different types of companies do not bat for the market of functional foods with even chances. The balance of advantage lies with the multinational food companies as they usually own several established and well-known brands, furthermore they have the resources necessary for product development and marketing of functional food (Menrad, 2003).

It should be mentioned that not only food manufacturers, but also the pharmaceutical industry has become interested in this field. In consequence of this has led to the so-called grey area which describes the overlapping of the interests of food and pharmaceutical industries (Farr, 1997; Kotilainen et al., 2006; Mark-Herbert, 2004). This latter is represented by several companies such as Novartis Consumer Health, Glaxo SmithKline, Johnson & Johnson or Abbott Laboratories. One important motivation for such companies to invest in functional food is the shorter development times and lower product development costs compared to pharmaceutical products. In addition, these companies have intensive experience in organizing clinical trials to substantiate health claims of a specific product. Against the above-mentioned, pharmaceutical companies generally failed to gain foothold in the functional foods market due to the incompetence of developing and marketing a high-quality food product (Bech-Larsen & Scholderer, 2007).

In particular, Novartis Consumer Health has launched a series of functional food products including biscuits, cereal, cereal bars and beverages in different European countries under the brand "AVIVA" in 1999. However, due to lower sales than expected, Novartis withdrew the AVIVA products from most markets after 1 year (Menrad, 2003; Side, 2006).

A third group of functional food producers are companies specialized in a particular product category, which mostly belong to the market leaders on a national level, for example Molkerei Alois Müller ("ProCult" dairy products), Eckes (ACE drinks) or Becker Fruchtsafte (ACE fruit juice) in Germany.

There is a limited number of small and medium-sized food companies (SMEs) active in the functional food market as well. These companies mostly produce functional products for market niches or offer "me-too" products following the pioneering products of the multinational companies. Often these products can "survive" only for a rather short time period (e.g. up to 2 years). In general, SMEs lack the know-how and resources for own intensive R&D activities and cannot afford to spend high sums in specific information or advertising activities necessary to open a specific segment of the functional food market as pioneering company (Menrad, 2003).

Food retail companies are increasingly starting to introduce private label brands especially in the relatively "mature" markets of functional dairy products. In Germany, for example, this relates in particular to food discounters like Aldi, Lidl and Penny, which have launched pro- and prebiotic dairy products in recent years (Menrad, 2003).

Table 1
Prominent types of functional food (Kotilainen et al., 2006; Spence, 2006)

Type of functional food	Definition	Example
Fortified product	A food fortified with additional nutrients	Fruit juices fortified with vitamin C
Enriched products	A food with added new nutrients or components not normally found in a particular food	Margarine with plant sterol ester, probiotics, prebiotics
Altered products	A food from which a deleterious component has been removed, reduced or replaced with another substance with beneficial effects	Fibers as fat releasers in meat or ice cream products
Enhanced commodities	A food in which one of the components has been naturally enhanced through special growing conditions, new feed composition, genetic manipulation, or otherwise	Eggs with increased omega-3 content achieved by altered chicken feed

Some examples of functional food products

Most early developments of functional foods were those of fortified with vitamins and/or minerals such as vitamin C, vitamin E, folic acid, zinc, iron, and calcium (Sloan, 2000). Subsequently, the focus shifted to foods fortified with various micronutrients such as omega-3 fatty acid, phytosterol, and soluble fiber to promote good health or to prevent diseases such as cancers (Sloan, 2002). More recently, food companies have taken further steps to develop food products that offer multiple health benefits in a single food (Sloan, 2004).

Functional foods have been developed in virtually all food categories. From a product point of view, the functional property can be included in numerous different ways as it can be seen in Table 1. It should be emphasized however, that this is just one of the possible classifications. According to alternative classification some functional products are (1) "add good to your life", e.g. improve the regular stomach and colon functions (pre- and probiotics) or "improve children's life" by supporting their learning capability and behaviour. It is difficult, however to find good biomarkers for cognitive, behavioural and psychological functions. Other group (2) of functional food is designed for reducing an existing health risk problem such as high cholesterol or high blood pressure. A third group (3) consists of those products, which "makes your life easier" (e.g. lactose-free, gluten-free products) (Mäkinen-Aakula, 2006).

Functional food products are not homogeneously scattered over all segments of the food and drink market and consumer health concerns and product preferences may vary between markets. These products have been mainly launched in the dairy-, confectionery-, soft-drinks-, bakery- and baby-food market (Kotilainen et al., 2006; Menrad, 2003). The most prominent types of functional products are presented briefly in the followings.

Probiotics

Recently, both in Japan and Europe the market of functional food is dominated by gut health products, in particular probiotics (Alzamora et al., 2005; Jones & Jew, 2007; Saarela, Lähteenmäki, Crittenden, Salminen, & Mattila-Sandholm, 2002) with 379 product launches worldwide in 2005 (Ouwehand, 2007). Probiotics are defined as "live microorganisms, as they are consumed in adequate numbers confer a health benefit on the host", with ongoing controversy as to whether cultures must be viable for efficacy in all cases (Charalampopoulos, Pandiella, & Webb, 2003; Charalampopoulos, Wang, Pandiella, & Webb, 2002; Stanton et al., 2005). Lactic acid bacteria (LAB) and bifidobacteria, the most studied and widely employed bacteria within the probiotic field, are normal components of the intestinal microbiota and have a long tradition of safe application within the food industry (Kociubinski & Salminen, 2006).

Among probiotics dairy products are the key product sector accounted for sales of around 1.35 billion US$ in 1999 (Hilliam, 2000b; Ouwehand, 2007) and about 56% of functional foods' total 31.1 billion US$ global sales in 2004 (Benkouider, 2005b). The main markets of dairy probiotics are Scandinavia, the Netherlands, Switzerland, Croatia, Estonia, while Greece, France and Spain can be considered as developing markets (Mäkinen-Aakula, 2006).

Table 2
Some commercial examples of probiotic products

Brand/trade name	Description	Producer
Actimel	Probiotic drinking yogurt with *L. casei Imunitass*® cultures	Danone, France
Activia	Creamy yogurt containing *Bifidus ActiRegularis*®,	Danone, France
Gefilus	A wide range of LGG products	Valio, Finnland
Hellus	Dairy products containing *Lactobacillus fermentum ME-3*	Tallinna Piimatööstuse AS, Estonia
Jovita Probiotisch	Blend of cereals, fruit and probiotic yogurt	H&J Bruggen, Germany
Pohadka	Yogurt milk with probiotic cultures	Valašské Meziříčí Dairy, Czech Republic
ProViva	Refreshing natural fruit drink and yogurt in many different flavours containing *Lactobacillus plantarum*	Skåne mejerier, Sweden
Rela	Yogurts, cultured milks and juices with *L. reuteri*	Ingman Foods, Finland
Revital Active	Yogurt and drink yogurt with probiotics	Olma, Czech Republic
Snack Fibra	Snacks and bars with natural fibers and extra minerals and vitamins	Celigüeta, Spain
SOYosa	Range of products based on soy and oats and includes a refreshing drink and a probiotic yogurt-like soy–oat product	Bioferme, Finland
Soytreat	Kefir type product with six probiotics	Lifeway, USA
Yakult	Milk drink containing *Lactobacillus casei* Shirota	Yakult, Japan
Yosa	Yogurt-like oat product flavoured with natural fruits and berries containing probiotic bacteria (*Lactobacillus acidophilus*, *Bifidobacterium lactis*)	Bioferme, Finland
Vitality	Yogurt with pre- and probiotics and omega-3	Müller, Germany
Vifit	Drink yogurts with LGG, vitamins and minerals	Campina, the Netherlands

Germany, France, the United Kingdom and the Netherlands account for around two thirds of all sales of functional dairy products in Europe (Hilliam, 2000b). Such products have shown an impressive growth during recent years, bringing the market volume in Germany from around 5 million US$ in 1995 to 419 million US$ in 2000, of which 301 million US$ account for pro-, prebiotic and other functional yogurts and around 118 million US$ for functional dairy drinks (Menrad, 2003). In Central-Eastern Europe, e.g. in Czech Republic, Hungary or Romania the probiotics market is dominated by international companies such as Unilever or Danone and the majority of the national producers are only able to adopt technologies and product ingredients developed in other countries (Banykó, 2007). There is however an extensive research and development activity concerning probiotics resulted in a great number of special new dairy products (e.g. Synbiofir drinking kefir, Synbioghurt drinking yoghurt, HunCult fermented drink, Milli Premium sour cream, Aktivit quark dessert, New Party butter cream, Probios cheese cream) (Szakály, 2007).

This success of dairy probiotics can partly be explained by their general positive image among consumers (Mäkinen-Aakula, 2006; Szakály, Szigeti, Máthé, & Szente, 2007), however several other factors support the development: the products kept at cold (4 °C/8 °C), they have relatively short shelf life (28–35 days), all nutrients for probiotics growth available and guidelines as well as regulations for dairy applications are readily available. On the contrary the sensitivity of probiotics to physical and chemical stress, heat and acidity makes the product development challenging for other type of food products (Mattila-Sandholm et al., 2002). Recently, encapsulation was assessed as possible technology for decreasing sensitivity of such probiotics (Clair, 2007; Mattila-Sandholm et al., 2002).

Fruit juice has also been suggested as a novel, appropriate medium for fortification with probiotic cultures because it is already positioned as a healthy food product, and it is consumed frequently and loyally by a large percentage of the consumer population (Tuorila & Cardello, 2002). However, research has shown that for example, perceptible off-flavours (e.g. dairy, medicinal, savoury) are associated with probiotic orange juices (Luckow & Delahunty, 2004; Luckow, Sheehan, Delahunty, & Fitzgerald, 2005; Luckow, Sheehan, Fitzgerald, & Delahunty, 2006), which might be a limitation of the market success. Some commercial examples of probiotics are listed in Table 2.

Prebiotics

Prebiotics are non-digestible food ingredients that beneficially affect the host by stimulating the growth and/or activity of one or a limited number of bacteria in the colon, thus improving host health (Charalampopoulos et al., 2003; Stanton et al., 2005). The world demand for prebiotics is estimated to be around 167,000 tons and 390 million Euro. Among them fructo-oligosaccharide (FOS), inulin, isomalto-oligosaccharides (IMO), polydextrose, lactulose and resistant starch are considered as the main prebiotic components. Primarily oligosaccharides, such as soy oligosaccharides (SOS), galacto-oligosaccharides (GOS) and xylo-oligosaccharides (XOS) are also marketed in Japan (Ouwehand, 2007). Oligosaccharides play important role in obesity control through resulting increased satiety and reduced hunger (Bosscher, 2007; Bosscher, Van Loo, & Franck, 2006; Cani, Neyrinck, Maton, & Delzenne, 2005). Inulin and oligofructose, non-digestible fermentable fructans, are amongst the most studied and well established prebiotics (Gibson, 2004). Besides being prebiotics, these compounds have shown to increase calcium absorption, thus improve both bone mineral content and bone mineral density (BMD) (Bosscher et al., 2006). Furthermore, they influence the formation of blood glucose, and reduce the levels of cholesterol and serum lipids (López-Molina et al., 2005). Prebiotics might enhance the growth and survival of the probiotic cultures by influencing the growth and metabolites of both the probiotic and the starter. Due to the potential synergy between probiotics and prebiotics, foods containing a combination of these ingredients are often referred to as synbiotics (Gibson & Roberfroid, 1995).

Functional drinks

Another important product category within the functional food segment is non-alcoholic beverages fortified with vitamins A, C and E or other functional ingredients. Although, there is a relatively high number of a product available in this segment, the market is still small and fragmented in most European countries. Germany is the only country in Europe with a sizeable functional drink market, mainly due to the success of ACE drinks in this country. In 1999 these beverages reached a market volume of 89 million US$ up from sales of around 15 million US$ in 1996 (Hilliam, 2000a). In 2000 more than 117 million l of vitaminized non-alcoholic beverages were consumed in Germany, which equals to around 1% of the total consumption of these beverages (Menrad, 2003).

Other types of functional drinks are those of cholesterol-lowering drinks (with combination of omega-3 and soy), "eye health" drinks (with lutein) or "bone health" drinks (with calcium and inulin) (Keller, 2006). In Estonia, for example fortified juices are produced under the trade name of Largo containing inulin, L-carnitine, vitamins, calcium and magnesium as functional ingredients (Tammsaar, 2007). The European functional drink market was estimated to be around 7% of the total soft drink market in 2004, with a further increase to 8% in 2005. According to the predictions the consumption will reach 5.1 billion l by the year of 2009, which corresponds to 23% increase compared to that of 2005 (Keller, 2006).

Functional cereals

Cereals, in particular oat and barley, offer another alternative for the production of functional foods. The multiple beneficial effects of cereals can be exploited in different ways leading to the design of novel cereal foods or cereal ingredients that can target specific populations. Cereals can be used as fermentable substrates for the growth of probiotic microorganisms. Additionally, cereals can be applied as sources of non-digestible carbohydrates that besides promoting several beneficial physiological effects can also selectively stimulate the growth of lactobacilli and bifidobacteria present in the colon and act as prebiotics. Cereals contain water-soluble fiber, such as beta-glucan and arabinoxylan, oligosaccharides, such as galacto- and fructo-oligosaccharides and resistant starch, which have been suggested to fulfill the prebiotic concept. Finally, cereal constituents, such as starch, can be used as encapsulation materials for probiotics in order to improve their stability during storage and enhance their viability during their passage through the adverse conditions of the gastrointestinal tract (Brennan & Cleary, 2005; Charalampopoulos et al., 2002).

Some functional cereal components such as beta-glucan, however, applied also in the dairy and bakery industries. Recent research has focused on the use of beta-glucans, in the manufacture of low-fat ice creams and yogurts. Incorporation of beta-glucans with other soluble dietary fiber, into low-fat dairy products can make their mouthfeel, scoopability and sensory properties resemble those of full-fat products (Brennan & Cleary, 2005). Other EU research project was performed recently in order to design different foods with improved functionality and superior health effects using cereal beta-glucans (Poutanen, 2006).

Bakery products

While functional foods are rapidly increasing in popularity in such sectors as dairy products or confectionery, in bakery it is still relatively underdeveloped. For example, in Germany about 20–21% of the new functional food products launched in 2001 were dairy and confectionary product and only about 13% were from the bakery industry (Menrad, 2003). This difference was found to be even higher in Spain in 2006, where about 45% of the launched functional food products were dairy food compared to about 13% of the functional bakery product (Monár, 2007). Bakery products however provide ideal matrix by which functionality can be delivered to the consumer in an acceptable food. In late 2003, Unilever innovated the bakery sector by introducing a white bread called Blue Band Goede Start, which was the first white bread containing the nutritional elements normally available in brown bread including fibers, vitamins B1, B3 and B6; iron; zinc; inulin, a starch that comes from wheat (Benkouider, 2005a). In developing functional bakery products (including bread), it is important to realize that achieving functional food quality does not simply involve delivering the active principle at the appropriate level for physiological effectiveness, but also supplying a product which meets the consumer's requirements in terms of appearance, taste and texture (Alldrick, 2007).

Spreads

It can be assumed that cholesterol-lowering spreads will gain increasing relevance in the coming years due to the market introduction of e.g. a functional variety of Becel® margarine of Unilever (named "Becel pro-activ"), containing phytostanol esters which are supposed to lower the cholesterol level. A product with similar characteristics named "Benecol®" has already been launched by the Finnish company Raisio in some Scandinavian countries in the mid-1990s. More recently the Benecol® brand was completed with spreads containing camelina oil as a source of omega-3 fatty acids (Hopia, 2006). Low-cholesterol butter under the trade name of Balade™ has been produced and marketed in Belgium since 1992. In this case more than 90% of the cholesterol in milk fat has been removed by the addition of crystalline beta-cyclodextrin to the molten butter. Other low-cholesterol milk products, like cheese, cream, or even low-cholesterol egg, are produced by this technology (Szente & Szejtli, 2004).

Functional meat

Meat and its derivatives may also be considered functional foods to the extent that they contain numerous compounds thought to be functional. The idea of using food for health purposes rather than for nutrition opens up a whole new field for the meat industry. In addition to traditional presentations, meat industry can explore various possibilities, including the control of the composition of raw and processed materials via reformulation of fatty acid profiles or inclusion of antioxidants, dietary fiber or probiotics, etc. (Jiménez-Colmenero, Carballo, & Cofrades, 2001; Kovács, Zsarnóczay & Gasparik Reichardt, 2007; Mendoza, Garcíá, Casas, & Selgas, 2001; Ricondo & Ayo, 2007; Scollan, 2007).

Functional eggs

Eggs are of particular interest from a functionality point of view, because they are relatively rich in fatty acids and the associated fat-soluble compounds. The type and ratio of fatty acids is an important determinant of human health. The idea of egg enrichment with omega-3 fatty acids simultaneously with antioxidants and other vitamins has recently been used to produce VITA Eggs by Freshlay Foods (Devon, UK). They state that their eggs were enriched with omega-3 fatty acids, Se, vitamins D, E, B12 and folic acid. Eggs enriched in omega-3 and vitamin E produced by Belovo under the trade name of Columbus first appeared in Belgium in 1997, and since then they have been sold in the UK (from 1998), The Netherlands (from 1999), India, Japan and South Africa (from 2000). Currently, production of Columbus egg exceeds 50 millions/year in Europe. Similar eggs are produced by Pilgrim's Pride Company, Gold Circle Farms and OmegaTech in the USA (Surai & Sparks, 2001).

Development and marketing of functional food—some considerations

Several mid- and long-term developments in society, as well as socio-demographic trends are in favour of functional food, so that it can be assumed that functional food represents a sustainable category in the food market (Bech-Larsen & Scholderer, 2007; Jones & Jew, 2007; Van Kleef, Van Trijp, Luning, & Jongen, 2002). Among supporting trends it can be mentioned that both experts (such as e.g. medical doctors, nutritional advisers) and consumers have realized and have started to accept that a close connection between nutrition and state of health exist (Hilliam, 1998; Menrad, 2003; Young, 2000). According to numerous studies, consumers are also increasingly reflective in matters of health and willing to adopt health-oriented changes in their eating habits (Niva, 2007).

It is not a neglectable aspect that functional food products help to ensure an overall good health and/or to prevent/manage specific conditions in a convenient way (i.e. through daily diet) (Benkouider, 2005a; Poulsen, 1999; Sloan, 2000). Moreover, it is beyond doubt that persuading people to make healthier food choices would provide substantial (public) health effects (e.g. decreased mortality, and increased quality of life), therefore it is a common economic and public interest (Jones & Jew, 2007; Van Kleef, Van Trijp, & Luning, 2005). This increasing consumer awareness in combination with advances in various scientific domains, provides companies with unique opportunities to develop an almost infinite array of new functional food concepts (Biström & Nordström, 2002; Van Kleef et al., 2002). It should also be considered, that functional foods are sold at higher prices, thus contain larger profit margins than conventional foods, which obviously make the sector attractive for the players in the supply chain (Kotilainen et al., 2006).

Against the above-mentioned advantages, the development and commerce of these products is rather complex, expensive and risky as special requirements should be answered (Van Kleef et al., 2002, 2005). This development and marketing require significant research efforts. This involves identifying functional compounds and assessing their physiological effects; developing a suitable food matrix, taking into account bio-availability and potential changes during processing and food preparation, consumer education, and clinical trials on product efficacy in order to gain approval for health-enhancing marketing claims (Kotilainen et al., 2006). It is a multistage process that requires input from commercial, academic and regulatory interests, with a critical need to achieve acceptance by the consumers (Jones & Jew, 2007). Businesses that want to succeed in this market will have to find new ways of conducting management, in particular in identifying critical technologies. This refers to building internal skills, employing innovative external sourcing, developing new markets, establishing alliances, developing packaging, building strong brands and finding venture capital for new developments. These strategic options are quite uncharacteristic for the traditional food industry (Kotilainen et al., 2006; Mark-Herbert, 2004).

For successful functional food development, both consumer needs and opportunities originating in life sciences need to be taken into consideration from the earliest phases (Ares & Gámbaro, 2007; Plaami, Dekker, Dokkum, & Van Ockhuizen, 2001; Van Kleef et al., 2002). Furthermore, legislative aspects have to be taken into account. Especially in Europe, companies attempting to launch a functional food have faced a variety of legislative frameworks regulating the approval of products, the kinds of nutrition information required on labels, and the types of functional and health claims that were allowed in connection with a product, often in a way that was highly inconsistent between EU member states (Bech-Larsen & Scholderer, 2007). Recently, however, the "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" has entered into force (EC, 2006).

An effective scientific research itself does not make a product successful in the market. The product should be in an adequate form so that the consumers could easily accept it (Van Kleef et al., 2005). These foods are not intended merely to satisfy hunger and provide humans with necessary nutrients, but also to prevent nutrition-related diseases and increase physical and mental well-being of consumers (Menrad, 2003). Therefore, as one of the first steps of product development, it is necessary to explore which diseases consumers are concerned about so that the product could be successful in the market (Van Kleef et al., 2005). According to surveys, primary health concerns among consumers are cardiovascular diseases, stress, high blood pressure, malignant tumour diseases of the digestive system, arthritis and obesity (Drbohlav, Roubal, Binder, Šalaková, & Plechacová, 2007; Hilliam, 1998; Keller, 2006; Korzen-Bohr & O'doherty Jensen, 2006; Van Kleef et al., 2002, 2005). It is more interesting, however, to identify those diseases that consumers would make much account of preventing them by nutrition. From the consumer point of view, the success of functional foods relies on a number of inter-relating factors, including the level of concern about general health and different medical conditions, the belief that it is possible to influence one's own health and awareness and knowledge of foods/ingredients that are supposed to be beneficial.

Sometimes products for which, communications created a holistic health image (e.g. Danone's Actimel) – often in a positive framing such as promotion of general well-being and the prolongation of youth – are preferred against products with highly specific functional or health claims. These products appeal only to small market niches, particularly when communications used a negative or too scientific framing such as the prevention of specific diseases. It may seem paradoxical that the more "evidence-based" a functional claim is, the less likely it is to appeal to the consumer market. However, qualitative researches suggest that consumers do not generally have the necessary background knowledge to evaluate specific functional claims and relate them to their personal health unless they, or a person very close to them, have been diagnosed with the disease or nutrition problem in question (Bech-Larsen & Scholderer, 2007; Verbeke, 2006). On the other hand, with the above-mentioned EU legislation on specific health claims, the so successful holistic well-being claims will be prohibited in product-related communications in the future (Bech-Larsen & Scholderer, 2007).

A popular statement often used in food industry seems to be that health claims on foods that emphasize the positive contributions to life (referred to as life marketing) are preferable over food claims that emphasize disease (referred to as death marketing) as focal point. This means that consumers prefer "improving" functional foods to others which decreasing the risk of diseases (Aaker & Lee, 2001; Menrad, 2003). Van Kleef et al. (2005), however arrived at the opposite conclusion. They found that the prevention of physiologically based illnesses like cardiovascular disease and osteoporosis are much more expected than psychologically based health problems like stress and fatigue. The success of either life marketing or death marketing strongly depends on the health claims oriented by the product. For instance, in the case of a product playing a pivotal role in the reduction of the risk of cardiovascular diseases, death marketing is more effective, while life marketing is more expedient when advertising a product giving extra energy. This approach had been confirmed by Levin, Schneidner, and Gaeth (1998), who stated that sometimes negative information is more informative, attracts more attention and stimulates deeper information processing than positive information.

The market development is influenced by the degree of familiarity and acceptance of functional food as well. According to surveys in different European countries consumers often do not know the term "functional food" or similar phrasing, but show a rather high agreement to the concept. In the United Kingdom, France and Germany, up to 75% of the consumers have not heard about the term "functional food", but more than 50% of them agree to fortify functional ingredients in specific food products (Hilliam, 1999). Another study found that while in Belgium 49% of the consumers is familiar with the term of functional food, this ratio in Poland is only 4% (Krygier, 2007). In Hungary the expression of "functional" proved to be unknown for about 70% of the respondents, according to a market survey at the University of Kaposvár, Hungary (Szakály, Szente, & Szigeti, 2004).

As a consequence, the acceptance of a specific functional ingredient is linked to the consumer's knowledge of the health effects of specific ingredients. Therefore, functional ingredients, which have been in the mind of consumers for a relatively long period (e.g. vitamins, fiber, minerals) achieve considerably higher rates of consumer acceptance than ingredients, which have been used since a short period of time (e.g. flavonoids, carotinoids, omega-3 fatty acids, selenium, xylitol) (Bech-Larsen & Grunert, 2003; Bech-Larsen & Scholderer, 2007; Krygier, 2007; Urala & Lähteenmäki, 2007). In the latter case consumers do not often know the health benefits of the specific groups of ingredients and therefore are not able to assess the health effects. In this sense, the health image of a functional food product or a specific ingredient represents a necessary prerequisite but cannot be regarded as being sufficient for a possible market success.

Sometimes however, consumers buy the product nonetheless they do not know the functional component. Niemann, Sommerfeld, Hembeck, and Bergmann (2007) reported, that according to a survey from 2006, a predominant part of the German consumers buy plant sterol enriched foods without being aware the labelling information and nearly half of the users of such products do not belong to the intended target group of people (those wanting to lower their blood cholesterol).

Previous research (Jonas & Beckmann, 1998; Poulsen, 1999) has suggested that the acceptance of functional foods depends on the basic product that serves as carrier for the functional ingredient and/or health claim. Bech-Larsen and Grunert (2003) explored two enrichments (omega-3s and oligosaccharides) for three different products (orange juice, flavoured yogurt and spread). They found that the two enrichment conditions were seen as less healthy for juice and flavoured yogurt, but quite healthy for spreads. The authors suggested as explanation, that in general spread is perceived as a somewhat unwholesome product, which could benefit from nutritional improvement to a larger extent than juice and yogurt, which are already perceived as inherently wholesome. Their results may indicate that consumers in general find enrichment of "non-healthy" foods more justified than enrichment of foods, which are perceived as healthy per se. Other studies,

however, point in the opposite direction. Balasubramanian and Cole (2002) found that consumers' search for nutrition information in a given food category depends on how they perceive that category. Consumers may ignore nutrition information for fun foods, such as candy because these foods meet hedonistic (as opposed to health-related) needs. Cereal bars and other snack products are often seen more as treats and therefore, as less serious delivery mechanism. On the contrary, in the Netherlands, for example, over a third of sales stemmed from confectionery due to the long established and mature market for medicated boiled sweets, while market growth of functional gums were also particularly dynamic (Benkouider, 2005a). Functional confectionery has shown promising growth also in Hungary, where the sector grew by 18% in value terms from 2002 to 2004, reaching value sales of $21.6 million (Benkouider, 2005b).

In general however, consumers see products that are intrinsically healthy – such as yogurt, cereals, bread and juice – as credible carriers of functional messages. For example, Poulsen (1999) found that attitudes towards enrichment were generally more positive when the base product already contains the enriched substance (like calcium in milk). Roe, Levy, and Derby (1999) found a similar effect for the perception of healthfulness of functional foods. Prior beliefs about product healthfulness appear to override claim information.

Due to the limited consumers' knowledge and awareness of the health effects of newly developed functional ingredients, there are strong needs for specific information and communication activities to consumers in this respect (Biacs, 2007; Salminen, 2007; Wansink, Westgren, & Cheney, 2005). This relates in particular to pioneering companies opening a specific market segment, for which targeted information activities to consumers and opinion leaders (like e.g. medical doctors and nutritional advisers) are regarded as crucial success factor in the marketing of functional food. Examples of successful information campaigns indicate that the message of health effect of a specific product should be transferred in a manner that consumers can easily comprehend. In addition, specialist terminology and medical details should be avoided in such campaigns (Menrad, 2003). Consumers need to understand the benefits, not the "science" behind the product (Leathwood, Richardson, Sträter, Todd, & Van Trijp, 2007). A survey performed in Hungary, for example, revealed that elderly people less familiar with the term "unsaturated fatty acid" so the utilization of labelling is doubtful in the everyday practice (Bánáti, Lakner, & Szabó, 2007).

The importance of adequate information transfer is also favoured by the fact that in the case of several products functional properties do not significantly differ in sensory characters at first compared with conventional foods. Therefore consumers should be persuaded by positive attributes that functional foods bring so they could link the health effects to the product. Although a person might be able to acknowledge the health benefits of consuming a food – unless they can link the food to a particular health benefits – they will be less likely to consume it (Wansink et al., 2005). The role of educating consumer is therefore crucial because, unlike taste and other sensory traits, consumers cannot perceive directly the benefit of the product (Peng, West, & Wang, 2006; Urala & Lähteenmäki, 2004). To ensure reliable information transfer, only legally correct parameters for benefit communication should be used (Henning, 2007).

Consumer confidence in the information provided on functional foods may vary according to the information sources. According to a Finnish survey, consumers are very confident with health-related information coming from authorities and quite confident with information from newspapers, retailers, work cafeterias and even food manufacturers (Urala, Arvola, & Lähteenmäki, 2003). In Hungary, most of the population is extremely sensitive to nutritional–biological values, meantime their knowledge is restricted to the information transmitted by the media (Szakály et al., 2007), which often include potential health benefits not based on scientific facts. At the same time communication of information on health effect of products is under authority control and the regulation could differ in countries (Poulsen, 1999).

Consumer acceptance of functional foods

Consumer acceptance of the concept of functional foods, and a better understanding of its determinants, are widely recognized as key success factors for market orientation, consumer-led product development, and successfully negotiating market opportunities (Ares & Gámbaro, 2007; Gilbert, 2000; Grunert, Bech-Larsen, & Bredahl, 2000; Verbeke, 2005, 2006; Weststrate, Van Poppel, & Verschuren, 2002). Acceptance failure rates from recent food cases have shown that consumer acceptance is often neglected or at least far from being understood (Verbeke, 2005).

In the last years, therefore, several papers have reported empirical studies of consumer acceptance based on primary data collection. Most of these studies investigated consumer reactions towards functional foods during the 1990s in the US (Childs, 1997; Childs & Poryzees, 1997; Gilbert, 2000; IFIC, 1999, 2000; Wrick, 1995). Among the studies focusing on European consumer reactions towards functional foods are those by Hilliam (1996), Poulsen (1999), Niva (2000, 2007), Anttolainen et al. (2001), Bech-Larsen, Grunert, and Poulsen (2001), Mäkelä and Niva (2002), Urala and Lähteenmäki (2003, 2004, 2006, 2007), Verbeke (2005, 2006), Verbeke, Moriaux, and Viaene (2001), Van Kleef et al. (2002, 2005), Korzen-Bohr and O'doherty Jensen (2006), Devcich, Pedersen, and Petrie (2007). These studies vary widely in terms of focus (consumer awareness of the concept, attitude towards functional foods, acceptance and choice) and methodologies used (qualitative or exploratory vs. quantitative or conclusive). From the diversity of the available studies, socio-demographic characteristics, cognitive and attitudinal factors emerged as potential determinants of consumer acceptance of functional foods.

Although Americans were believed to be overwhelmingly aware and accepting functional foods and are doing more to incorporate them into their diets (IFIC, 2000), consumer studies reported lower frequencies of healthy food consumption, despite equal intention and aspiration to eat healthily more often, as well as despite continuing confidence in the personal ability to manage one's own health. In the same study, it was shown that perceptions of taste and enjoyment of healthy foods have declined (Gilbert, 2000). Similarly, IFIC (2002) reported little familiarity among US consumers with terms commonly used to describe the concept of functional foods in 2002, despite consistently strong interest since 1998.

In Europe, the role of healthiness in the food choice is continuously increasing (Biacs, 2007). It should be mentioned however, that Europeans in general are far more critical with new products and technologies (e.g. GMO food, irradiated food) compared to American consumers (Bech-Larsen & Grunert, 2003; Lusk et al., 2004; Lusk & Rozan, 2005). They are not only suspicious of the safety of novel foods, but they are critical of the whole process through which food production becomes more and more anonymous and distanced from the everyday life (Poppe & Kjærnes, 2003). Therefore, it can be hypothesized that Europeans' acceptance of functional foods is less unconditional, better thought-out, and with more concerns and reserves as compared to the US. This may also originate from the recent sequence of food safety scares (e.g. BSE, dioxins, foot-and-mouth disease, *E. coli*, aviatic pneumonia, acrylamid) (Verbeke, 2005).

From the consumer's acceptance point of view surveys give a different account in each country. Jonas and Beckmann (1998) reported that functional foods were at risk of being a food category that consumers did not seem to embrace as enthusiastically as the food industry had hoped for. Danish consumers in particular, were suspicious about functional foods, which they judged as "unnatural and impure". Similarly, Niva (2000) and Mäkelä and Niva (2002) indicated that the need for functional foods is increasingly questioned in Northern European countries, hence yielding the conclusion that consumer acceptance of functional foods can not be taken for granted. On the contrary, attitudes towards functional foods were more positive in Finnish consumers compared to consumers in Denmark or the United States (Bech-Larsen & Grunert, 2003). Although the overall attitude in Finland is positive, buyers of functional foods generate impressions of being more innovative but not as nice as consumers of conventionally healthy foods (Saher, Arvola, Lindeman, & Lähteenmäki, 2004).

Functional foods differ from conventional foods but they are also viewed as being members of the particular food category to which they belong, rather than being considered as a specific, homogeneous group of products. When consumers make choice between conventional and functional food products, their reasons behind functional food choice are different within the different food categories (Ares & Gámbaro, 2007; Urala & Lähteenmäki, 2004). This is supported by Poulsen (1999), who discovered that both the enrichment substance and the type of product enriched strongly affect consumers' attitudes to functional products among Danish consumers. Therefore, functional foods should be studied not as one homogeneous group but as separate products within the various food categories.

Relevant papers addressed cognitive, motivational and attitudinal determinants of consumer acceptance of functional foods in different countries (Bech-Larsen & Grunert, 2003; Cox, Koster, & Russell, 2004; Urala & Lähteenmäki, 2004; Verbeke, 2005), provided insight in the profile of functional food consumers (Saher et al., 2004), or identified further consumer-oriented research issues (Frewer, Scholderer, & Lambert, 2003). All of the previously mentioned studies showed that consumer acceptance of functional foods is far from being unconditional, with one of the main conditions for acceptance pertaining to taste, besides trustworthiness of health claims. Other consumer studies have also pointed to the primary role of taste as a factor that directs consumers' food choice in general (Bech-Larsen et al., 2001; Grunert et al., 2000; Lönneker, 2007; Patterson, 2006; Urala et al., 2003). Although increasing the functionality of the food should not necessarily change its sensory quality (Urala & Lähteenmäki, 2004), bitter, acrid, astringent or salty off-flavours often inherently result from enhancing food functionality with bioactive compounds or plant-based phytonutrients. For instance, Drenowski and Gomez-Carneros (2000) indicated that food functionality enhancement poses a dilemma for functional food designers because of potential aversive consumer reactions to the resulting taste. Similarly, Tuorila and Cardello (2002) reported that the occurrence of off-flavours in juice decreased its acceptance and consumption despite the presence of convincing health claims. A relevant issue is whether any consumers are willing to accept functional foods that taste worse than substitute conventional foods, as suggested by Urala and Lähteenmäki (2004), and if so, what their profile is and what the determinants of their willingness to compromise on taste are.

Verbeke (2006) studied the socio-demographic and attitudinal determinants of Belgian consumer willingness to compromise on taste for health in the case of functional foods as a product category. Results showed that the gap between functional foods possessing good and bad taste had increased during 2001–2004. Moreover, while women and elderly people tended to compromise on taste on their account in 2001, this socio-demographic difference had faded by 2004. Therefore in the case of a functional product having bad taste, it would be rather risky to count on the compromise ability of consumers (Hilliam, 2003; Verbeke, 2006).

In contrast to the mentioned Belgian survey in 2004, several authors accredited key role to socio-demographic factors. As Table 3 shows most of these studies identified typical functional food consumer as being female, well educated, higher income class and older than 55. It seems obvious, that the higher socio-economic groups have higher willingness or ability to pay a price premium, as well as better knowledge and higher awareness (Hilliam, 1996).

In general, consensus is reached on the gender issue with respect to functional food acceptance: all studies consistently report female consumers as the most likely users or buyers. Females' stronger purchase interest towards functional foods (Childs & Poryzees, 1997) is especially important given their primary role as the person responsible for food purchasing (Bech-Larsen & Scholderer, 2007). In general, women have been shown to be more reflective about food and health issues and they seem to have more moral and ecological misgivings about eating certain foods than men, who are more confident and demonstrate a rather uncritical and traditional view of eating (Beardsworth et al., 2002; Gilbert, 1997; Teratanavat & Hooker, 2006; Verbeke & Vackier, 2004).

Another relevant socio-demographic factor pertains to the presence of young children in the household (Maynard & Franklin, 2003). This factor may impact food choice because of its potential association with higher food risk aversion or higher quality consciousness, as exemplified for instance for fresh meat after the BSE crisis (Verbeke, Ward, & Viaene, 2000). Furthermore, parenting triggers focus on nutrition (Childs, 1997), which yields a search for nurturing benefits through the provision of wholesome foods that lay a strong foundation of health for children (Gilbert, 2000).

Finally, experience with relatives' loss of good health and associated economic and social consequences have been reported

Table 3
A typical functional food consumer in USA and in Europe as described by different socio-demographic parameters

Age	Gender	Education/income	Reference
USA			
35–55	Female	Well-educated/higher income	Childs (1997)
35–60	Female	Higher education/higher income	Teratanavat and Hooker (2006)
45–74	Female	Collage graduate	IFIC (1999)
55+	Female	Collage educated	Gilbert (1997); IFIC (2000)
Europe			
55+	Female	Lower educated	Poulsen (1999)
55+	Female	Higher socio-economic class	Hilliam (1996)
		Higher education/higher income	Anttolainen et al. (2001)

to act as an incentive to adopt disease preventative food habits (Childs, 1997; Maynard & Franklin, 2003). Middle-aged and elderly consumers are more aware of health issues simply because they, or members of their immediate social environment, are much more likely to be diagnosed with a lifestyle-related disease than are younger consumers (Verbeke, 2006). Given the fact that prevention is a major motivation of use of functional food (Verbeke, 2006; Wrick, 1995), it can logically be hypothesized that experience with illnesses increases probabilities of functional food acceptance.

It should be emphasized however, that when considering the influence of gender, age and education, both the type of functional food and its claim (e.g. health claims vs. appearance claims) have to be included. Stewart-Knox et al. (2007) investigated the consumer uptake of functional food in several European countries (France, GB, Germany, Italy, Poland and Portugal). Their study revealed that younger people, in particular females, seeks for foods to control appetite and body weight, while older people demand foods to lower cholesterol and blood pressure. They also found that individuals educated beyond primary level seek functional foods more frequently than those of less educated. Another recent study performed in the UK in 2006 by Chambers and Lobb (2007) reported no influence of education level on the acceptance of functional products.

Devcich et al. (2007) found, that people with high "modern health worries" (e.g. concerns about cell phones, high-tension power lines, vaccination programmes, pesticide residue, genetic modification, as well as hormones and additives in food) were more likely to choose functional foods with disease-preventing properties than either risk-reducing or appearance-enhancing properties.

Examples of recently launched functional food products indicate that consumers are only willing to accept limited price premia for such products. In general, price premia of 30–50% are observed in high volume functional food segments like functional dairy products or ACE drinks (Menrad, 2003), however for some products it can raise up to 500% (Kotilainen et al., 2006). In this sense, relatively high price premia can be regarded as one reason for the limited market success of several functional food products in recent years in Europe.

Within the frame of a study by Urala and Lähteenmäki (2003) the laddering interviews also showed that consumers connect functional foods with control over life and health, being a better person and feelings of well-being. The use of functional foods may offer a new, less-demanding way of gaining an ethical reward through food choices: consumers feel that they take care of themselves and make the "right" choices that are socially acceptable. This rewarding feeling may be connected not only to control over one's own health but also to the positive impressions that an individual perhaps wants to evoke among other people (Urala & Lähteenmäki, 2004). Saher et al. (2004) found, that subjects who had functional foods on their shopping list were regarded as more innovative but less friendly compared to consumers whose shopping list contained conventional products. These authors also found that functional food users were also regarded as selfish and not gentle, especially when women were assessed. In the minds of consumers, using functional foods not only reflects a positive health concern, but it may also come with social costs.

Conclusions

There is no doubt that functional foods generate one of the most promising and dynamically developing segments of food industry. There are several factors supporting the inflow of functional products like the increasing consumer awareness in combination with new advances in various scientific domains.

Functional foods have been developed virtually in all food categories, however their distribution over the segments of the market is not homogeneous and product preferences may vary between markets. In particular, in Europe there are large regional differences in acceptance of functional foods.

The development and commerce of functional food products is rather complex, expensive and risky, as special requirements should be answered. In the case of a successful product development attention should be paid both to consumer demands and technical conditions, furthermore, the legislation background should not be neglected. Especially multinational companies could meet the special requirements occurring during the development and marketing of functional foods. They possess the adequate R&D activities, the know-how and economic potential due to their well-known products that give them the opportunity to introduce a brand new product to the market.

Consumer acceptance of the concept of functional foods has been widely recognized as key success factors for market orientation, consumer-led product development, and successfully negotiating market opportunities. Acceptance, however, is determined by a host of factors such as primary health concerns, consumers' familiarity with the "functional food" concepts and with the functional ingredients, the nature of the carrier product, the manner of health effect communication, etc. Consumers' knowledge and awareness of the health effects of newly developed functional ingredients seems to be rather limited, therefore there is strong need for specific communication activities to consumers in this respect. The message of the health effect of a specific product should be transferred via credible media in a relatively simple way, so that it could easily achieved by the consumers.

Different surveys showed that consumer acceptance of functional foods is far from being unconditional, with one of the main conditions for acceptance pertaining to taste, besides, product quality, price, convenience and trustworthiness of health claims. As a rule, consumers seem to evaluate functional foods first and foremost as foods. Functional benefits may provide added value to consumers but cannot outweigh the sensory properties of foods.

By purchasing functional foods in general consumers may achieve a modern and positive impression of themselves. These products provide consumers a modern way to follow a healthy lifestyle, which differs from the conventionally healthy diet defined by nutrition experts. In general, the attitude both to functional foods and to their consumers is positive, so such a concept represents a sustainable trend in a multi-niche market.

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