

## Functional foods, trends and future

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The concept of functional foods is often considered to have emerged in Japan in the late 1980s. However, functional foods actually have a quite long history. In China, Japan and other Asian countries, many types of foods have traditionally been associated with specific health benefits. In Western societies, a well-known global brand, namely Coca-Cola, actually started as a functional food at the beginning of the twentieth century. What is probably of more recent origin is the development of nutritional science backing functional foods. During the second half of the twentieth century, exciting new nutritional insights emerged that allowed for the development of foods and beverages with a claimed health benefit, based on scientific evidence.

From a market perspective, functional foods are difficult to quantify because different definitions are used. If we view functional foods as foods that make specific health claims, then the market in the USA, Japan and Europe is estimated to be worth about €7 billion. The functional foods market can, however, be seen as part of a broader health-based/driven foods market. This includes natural and organic foods, ‘low and lite’, weight management and vitamin- and mineral-fortified products as well as functional foods. This latter market is very large with a global estimate of around €95 billion for the year 2000. The most popular foods are energy/sports drinks, probiotic dairy products, heart health spreads and ready-to-eat cereals. Major functionality claims are for gut health (especially in Japan and Europe), heart health (especially in the USA and Europe), promoting natural defences, and boosting energy levels. The outlook for the future for health-based/driven foods is bright. An overall growth rate of 10% per annum for the next five years is possible, significantly outperforming the overall foods and beverage market’s growth of about 2% per annum.

To get back to the history of functional foods, let us elaborate one of the first examples of a functional food with a specific health claim. In the late 1960s, Unilever developed spreads high in polyunsaturated fatty acids aimed at reducing blood cholesterol level. Spreads under the Becel and Flora brands were developed based on mechanistic understanding and clinical efficacy data (Keys *et al.* 1965) and were targeted initially at hypercholesterolaemic patients. These products developed gradually

into successful mainstream consumer products. This example shows that functional foods can indeed help in addressing specific consumer needs and can actually contribute to improvement of public health. In many European countries, increasing sales of products enriched with polyunsaturated fatty acids were paralleled by more favourable ratios of polyunsaturated to saturated fat in national diets, as advocated by many nutritional authorities around the globe (National Heart Foundation of Australia, 1999; Health Council of the Netherlands, 2001). An example of the impact of health-driven foods without a specific health claim is in the ‘low and lite’ area. In The Netherlands, there has been a decrease in fat consumption in recent years. Although the decrease is moderate compared with the recommendations of health authorities, data from food consumption surveys (Anonymous, 1988; Anonymous, 1998) show that the decrease is due to changes in the composition of industrial products, rather than to changes in food choices or preferences of consumers.

More recently, the arena of cholesterol-lowering spreads was extended further by products with increased efficacy through the addition of plant sterols or stanols (Law, 2000). This again demonstrates that developments in nutritional science can be incorporated successfully into functional foods, if there is sufficient consumer awareness and need. However, sound science and perceived consumer need from a public health perspective are no guarantee for the success of functional food products, as unfortunate examples of unsuccessful market introductions show. It is hard to predict the prerequisites for success of a functional food, but factors undoubtedly include consumer need and awareness; consumer acceptance of a food solution; powerful communication of health benefits to the consumer; uncompromised taste; optimal convenience; adequate retail or out-of-home availability; proven safety and efficacy; acceptable price level; assurance and support from different sources, including scientific opinion leaders; and a clear regulatory framework for making claims, providing a level playing ground for all companies. The reader may be disappointed that nutritional science does not feature prominently in this list of prerequisites, but it is a condition *sine qua non*. The list does demonstrate that, from the perspective of industrial research and development but probably also from the public health perspective, research in

**Abbreviations:** FUFOSE, Functional Food Science in Europe.

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functional foods will only pay off if it is closely integrated with the other prerequisites for success of a functional food.

The functional foods that we find on the market today are often based on general discoveries in nutritional science, and less on a deliberate research strategy to develop functional foods. Often, research was product-driven, i.e. aimed at identifying positive aspects of existing products and functional foods were then developed by optimising these positive aspects. For the future, an approach that integrates insights into consumer needs and demands (market pull) and a structured scientific research process (science push) will give the largest chance of real innovations. The scientific research process into functional foods will be powered by technology and insights available from other disciplines, such as informatics, pharmacology, engineering, proteomics and genomics. Insights into genetic susceptibility arising from the human genome project and possibilities for individualised health monitoring using micro-engineering and sensor technology may alter dramatically the way in which we deal with food and health. For this, however, consumer acceptance is a first prerequisite. This is also true for the attainments of modern biotechnology that may also have a major impact on possibilities to optimise functional foods.

Schematically speaking, the combination of 'market pull' and 'science push' in functional foods research will result in a research funnel starting from consumer needs and narrowing down to the final functional foods products by the following stepwise approach:

1. Consumer understanding: what kind of health benefits in foods or technology solutions do consumers really want?
2. Bio-informatics: what molecules could do the job?
3. *In vitro* screening and *in vivo* testing: which molecules work best in model systems?
4. Bioavailability: is the bioactive compound digested and absorbed?
5. Functional food technology: can we source the ingredient and make an attractive food?
6. Biomarkers: can we measure relevant effects in man?
7. Human intervention studies: does it really work?
8. Communication: how do we explain the benefits?

With regard to biological benefits in functional foods, the International Life Sciences Institute's concerted action on Functional Food Science in Europe (FUFOSE; Diplock *et al.* 1999) has proposed six broad groups that are considered relevant from a scientific perspective. These are (1) growth, development and differentiation; (2) substrate metabolism; (3) defence against reactive oxidative species; (4) the cardiovascular system; (5) gastrointestinal physiology and function; and (6) behaviour and psychological functions. These benefit categories indicate that functional foods should primarily be aimed at function improvement or (longer-term) disease risk reduction for 'healthy' people, and not at disease treatment for 'sick' people.

The broad categories identified by FUFOSE are still relevant, but the products that have been introduced on the market in recent years seem to indicate that although

there is a place for products specifically aimed at disease reduction, there also is a trend towards products providing 'daily health benefits'. Such functional benefits like healthy attractive skin, the ability to deal with stress and mental and physical performance may not always be exciting from a public health or medical science perspective, but they are very relevant for the consumer. In addition, providing a daily benefit can indeed contribute to longer-term health objectives. For instance, a daily benefit like satiety and all necessary nutrients from a low-calorie meal replacement has been shown to contribute to ability to lose weight and maintain a healthy dietary pattern. If products claim daily health benefits, then these will probably be in the area of 'functional benefits'. It should be clear that the same stringent criteria for claim substantiation should be applied for functional benefit claims as for disease reduction claims. As a result, there is a challenge in further developing the science to underpin functional food development in these areas.

Returning to the market for functional foods: what sectors will grow and what trends will rule in the next five years? We predict further growth of three distinct sectors. A first sector will be products making claims backed by extensive scientific research for which endorsement is key, especially in the area of heart health and weight management. Examples have been given previously. A second sector, also with scientific backing but focusing more on daily benefit claims, will target enhancement of physical and mental performance, with sports and energy drinks becoming even more popular. A third sector will be focused around general 'good for you' products that will make more 'general' claims, based on scientific evidence around ingredients being used such as probiotics and antioxidants, but with less extensive research on specific product claims. For all of these sectors, the range of success factors mentioned previously applies. Three of these success factors seem to be paramount: taste, convenience and trust. First, consumers, except for a small minority, will not be willing to sacrifice taste for health. Secondly, products must fit consumers' busy life-styles: ready-to-eat or ready-to-heat and on-the-go formats will become more popular. Third, we expect a more stringent regime for claims; such that industry is only allowed to communicate what it has evidence for. Consumers want to be able to trust claims. In a world with an abundance of choices we increasingly expect brands to become beacons of trust and guidance for consumers. Around these brands marketers will aim to build better relationships with consumers by providing on-line information and advice, and perhaps service options. Although there has been speculation about pharmaceutical companies taking an interest in functional foods, we foresee that for the next five years the sector will be dominated by, in particular, diversified food conglomerates and the dairy sector. Marketed products will be based on the findings of nutrition science of the last decade with a few new options added. Only when we take an outlook of, say, ten years may we expect that some functional foods will be marketed that take into account gene polymorphisms that may be relevant for

the development of chronic diseases. Also in that time frame we may see a comeback in Europe of ingredients for functional foods produced by modern biotechnology. Apart from the developed market, we expect that in developing markets the sector of health-based/driven foods will grow. This is already occurring in the form of vitamin and mineral fortification of popular foods for the general population, but quite soon we may also see the emergence of more advanced functional foods, e.g. targeting heart health or the increasing prevalence of overweight in developing countries.

The area of functional foods is beginning to come of age. Its adolescence will be driven by exciting new scientific developments. However, the area of functional foods will only grow successfully if we are able to integrate credible science with thorough consumer understanding, uncompromised taste and convenience, and effective communication. A key challenge to ensure the bright future of functional foods is to provide solid guarantees to consumers that they can trust the safety of functional foods and their promises about better health, performance, development or growth.

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