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Functional Foods: definition and commercialisation

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Abstract

This paper outlines the framework for a working definition of functional foods utilised by the National Centre of Excellence in Functional Foods, considers trends in the areas of influence, and raises issues for the successful commercialisation of functional foods by the Australian food industry.

Keywords

definition, foods, functional, commercialisation

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This paper outlines the framework for a working definition of functional foods utilised by the National Centre of Excellence in Functional Foods, considers trends in the areas of influence, and raises issues for the successful commercialisation of functional foods by the Australian food industry.

There are many definitions of functional foods, depending on the field of interest. From the science perspective, functional foods are those that provide benefits ' beyond basic nutrition' (Palou & others 2003), or that are functional at some physiological level (ADA 2004). Identification of these foods varies, with recognition that they incorporate new technologies (Anon 2004) but may also include whole foods (ADA 2004). Thus, functionality can emerge from the bioactive properties of ingredients in food formulations as well as from the food matrix of natural whole foods. From a market perspective however, the description of functional foods varies substantially from that used in the scientific literature. Here, terms such as 'just a little bit better for you', 'counting carbs', and 'healthier kids' (Sloan 2004), form categories of functional foods that sound very different to published scientific categories such as 'low fat food', 'whole oat products' and 'folate fortified cereal' (ADA 2004). Linked to marketing, but referenced to science, another key influencer is the regulatory environment. Here, published standards refer to the legality of claims about the health benefits of foods in terms of nutrient content and function, and disease risk. In this sense, functional foods could be seen as those that come under the governance of health claims legislation. With all this in mind, it is probably more helpful to talk about a 'working definition' of functional foods that recognises all the key influencers rather than assuming the definition is 'cut and dried' (Figure 1).

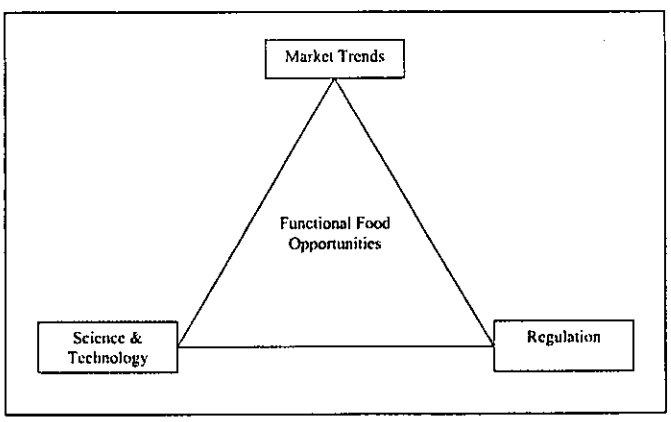

Figure 1. Working definition of functional foods

Market trends

The global functional food market has been estimated at $47.6b and growing (Sloan 2002), with trends to watch year by year. There appears to be strong agreement that the consumer wants better nutrition, and reports on trends indicate how consumers are responding to perceptions of benefits. If regulation demands a marriage between science and marketing, then a comparison between the market perceptions and science knowledge base is helpful. A review of the science concepts behind the top 10 trends published in 2002 and 2004 (Sloan 2002, 2004) indicates a core set of scientific underpinnings that vary in depth of knowledge (Table 1), but changes in marketing definitions do not necessarily reflect rapid shifts in the science base. Nevertheless, mapping the variation and determining capability in the science base will help in planning innovation in functional food development. For example (and bearing in mind that there is always more to know), there is a good working knowledge of the functional properties of macronutrients (protein, fat, carbohydrates), and of a wide range of vitamins and minerals in foods. New bioactives are constantly being identified, but it will take some time to bring the science base of these components to the level of the former list. Likewise, the functional properties of whole foods (and whole diets) are relatively under-researched. There is variation in the understanding of physiological end-points and biomarkers of disease, albeit enough in some areas to support food innovation. These latter areas (eg lifestyle disease prevention) can also be seen to support a range of functional food categories (Table 1). As to the full gamut of possibilities, the way in which key health benefits are researched and referred to in the marketing literature will vary depending on the amount of information available and the maturity level of the science in that area. For example, the science behind diet and heart disease is relatively strong, but may be less well developed in diet and stress management or eye health. In other areas, the perceived health benefit may not be linked directly to benefits to human physiology. For example foods that are 'free from' certain chemicals or production processes relate rather to a broader sense of health. Thus, from the marketing perspective, the consumer driven functional food market is not always referenced to nutritional science.

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Advances in science

In large part however, shifts in science have a significant impact on food innovation. Developments in food technology in particular are creating ever greater opportunities for innovation within the food industry (Mermelstein 2003). Associated scientific disciplines describe the chemical, physical and structural properties of foods, and bring together knowledge of biology and engineering (Frewer & others 2003). New product developments resulting from work in this area will provide functional foods that can be tested for health benefits through the discipline base of nutrition science.

The coalescence of nutrition science and food technology can also be seen from changing perspectives in the past century. Beginning with basic sanitation through to preventing deficiencies (particularly of vitamins and minerals), and then excesses through an understanding of the diet-chronic disease relationship, nutrition science is now focused on health and wellbeing, improving quality of life, preventing disease and reducing risk of disease (Schneeman 2003). The rationale for functional foods is well recognised by nutrition practitioners, notably dietitians, where an ageing population, increased healthcare costs, more aware and autonomous consumers, better scientific evidence and changes in food regulation lay the path for their effective use (ADA 2004, Patch & others 2004).

From a science perspective, functional foods may be studied with a view to food components (eg type of fat or bioactive ingredients), the whole food (eg milk, nuts), or whole diets (eg low carbohydrate). Establishing the evidence for the health benefits of functional foods may begin with research that provides a strong theoretical position (What is in there? How does it work? Can effects be shown in humans? Is there evidence of possible effects in population studies). Clinical studies prove the theory in practice, but even then reality testing and consumer understanding is required.

Recent advances in science can be seen in events such as the ILSI Workshop on Functional Foods at the 2004 conference of the Federation of American Societies of Experimental Biology. Here, control of food intake by gut hormones, fatty acid interactions with gene expression, low carbohydrate diets and dairy calcium and weight loss were the key topics (Anderson & others 2004, Tapsell 2004). The nature of the science presented

Table 1. Comparison of market trends for 2002/4 with nutrition science underpinnings

Top 10 trends 2002 [1]	Top 10 trends 2004 [2]	Scientific concepts
1. *Broader nutrient speciality ingredient fortification* (sources of nutrients, bioavailability, type and effects of protein, fibre benefits)	1. *Just a little bit better for you* (Ca, fibre, antioxidant fortified products, formulations enhancing bioavailability, low fat, organic)	1. *Functional properties of nutrients in foods* (protein, fat and carbs – types and amounts; vitamins and minerals – requirements; other bioactive substances – activity and bioavailability)
2. *Condition specific marketing* (fortified foods to promote heart health, provide energy, manage joint health, improve cognition/mood, promote intestinal health, optimal growth and development)	2. *Counting carbs* (low starch, commodity shifts, low carb candy bars)	2. *Functional properties of whole foods* (the food matrix, impact of organic methods)
3. *Lifestyle enhancers* (energy beverages, foods supporting immunity, stress management, sleep, and improved mental performance)	3. *Healthier kids* (snacks, fruit, yoghurt bars, organic foods)	3. *Links between food components and health benefits* (physiological end-points or biomarkers of effect/activity)
4. *Sports market crossover* (energy replenishment, protection and recovery for athletes, gym foods for active adults and kids' sport's products)	4. *Serious considerations* (preventing heart disease, obesity, diabetes, osteoporosis, fortified foods, soy, low GI)	4. *Key health benefits* (bone/eye/dental/ heart health, reduced heart disease risk factors, reduced appetite, bowel health, concentration, mood, meeting nutritional requirements, increased activity level, weight loss, reduced diabetes risk factors, reduced stress, healthy immune response, non-allergenic, reduced risk of contamination)
5. *Kids' health* (fortified foods for kids, foods to manage kids weight and lifestyle disease risk, foods that support mental focus and avoid allergens)	5. *Must have ingredients* (whole foods, omega 3, sterols, fortified and low energy density foods)	5. *Delivery systems* (bioavailability, taste, supply chain integrity)
6. *Gender, age and ethnic positioning* (women's and men's health, over 50's protective foods)	6. *Fizzy, fruity, flavoured* (healthier options – enriched, sourced, low energy density, carbonated, organic, satisfying)	
7. *Weight, satiety and appetite suppression* (foods that support weight management)	7. *High-powered alternatives* (stimulating energy drinks, high protein bars, soy alternatives)	
8. *Fast-forward for functional snacks* (diet and fortified candy and enriched snack bars)	8. *Pace-setting restaurants* (reduced portion sizes, healthier menu items, low carb)	
9. *Mother Nature knows best* (fish oils, probiotics, prebiotics, soy, whey protein)	9. *Naturally gourmet* (organic ready meals, coffee, ingredients – oils, condiments, snack foods with natural ingredients, vegetarian options, 'free from' options, 'wild' produce)	
10. *Non-traditional food markets* (foods supporting eye and dental health, healthy skin, nutraceuticals)	10. *International learnings* (reducing lifestyle disease risk, probiotics, bioactive dairy peptides, low GI, liquid breakfasts, grain milks, omega 3, olive oil).	

1. Adapted from Sloan (2002)
2. Adapted from Sloan (2004).

outlined the links between theoretical development in the basic sciences through to clinical trials as described above. An example of this type of work in Australia can be seen in studies of the impact of polyunsaturated fatty acids on appetite control mechanisms and body composition (Huang & others 2004), linked to a clinical trial demonstrating the impact of a whole food (walnuts) delivering PUFA in the diet on health outcomes in diabetes management (Tapsell & others 2004).

Regulation

Having conducted the science, the translation of key findings to promotional claims for products is one of the main challenges in commercialising functional foods. In large part, food standards regulate this process. There are differences in regulation around the world, but there are efforts towards harmonisation (Shimizu 2003), which is important for regional and world trade. The previous Joint Australia and New Zealand Food Standards Code, included a description of health claims (Standard 1.1A.2), but prohibits them on food except for the link between folate and a reduced risk of neural tubal defects (see *www.foodstandards.gov.au*). A new food standard, currently proposed (P293), will allow health claims at low and high levels, both requiring substantiation, but only high level claims needing pre-approval. Part of the consultation process has involved consideration of the early adoption of claims approved in other countries. Workshops in this area have suggested that there may be some preference for claims relating calcium to the prevention of osteoporosis, low saturated fat and cholesterol levels with reduced risk of heart disease, the benefits of fibre, fruit and vegetables as protective from cancer, and lower energy values for obesity prevention (see *www.nceff.com.au*). While this whole process has a way to go, it does suggest that manufacturers might consider both the nature and type of claim likely to be permitted for foods as one aspect of managing risk for proposed functional food development.

Conclusion

Innovation is central to remaining competitive, and the development of functional foods provides real opportunities for the Australian food industry in this regard. Precisely locating these opportunities, however, requires a working definition of functional foods that triangulates market trends with the science base and regulatory issues, where relevant. The heterogeneity of the food industry in Australia suggests that this will mean different things to different sectors, but the process will still apply. Determining what is best for Australia will take some time to work through, and is more likely to emerge through partnerships with industry groups to add a fourth dimension – the experience and capability of the industry itself. Commercialisation science is the weakest step in the development process and experience shows that a long term vision and a focus on proven starting points works best (Mellentin 2004). The National Centre of Excellence in Functional Foods is working towards this goal in setting up infrastructure and communicating frameworks for functional foods to produce benefits for the Australian food industry. It is a complex task, but a first pass suggests that all the ingredients are there.

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ADM receives second award for NovaLipid

The American Oil Chemists' Society has announced that the Archer Daniels Midland Company (ADM), received the 2005 AOCS Corporate Achievement Award. This Award recognises industry achievement for an outstanding process, product, or contribution that has made the greatest impact on its industry segment. The purpose of the award us to recognise and honour the contributors to an outstanding process and/or product, which represents a significant advance in the application of technology to a Division of the AOCS.

ADM was recognised for the development of innovative technologies for the production of healthier fats and oils. This is evidenced by the introduction of its *NovaLipid* line of zero/low *trans* fat oils and their potential impact on public health. ADM was one of the first companies to announce the development of low/zero *trans* oil products. A new line of products was introduced that uses enzymatic interesterification to obtain the need functionality, oxidative stability and health/nutrtional requirements of food oils. The ADM *NovaLipid* line includes a cookie shortening, and all purpose vegetable oil shortening, and all purpose pie and cake shortenings. This is the second award for this product (see *food Aust.* 57(6): 234, June 2005). □