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PAPER

Determinants of specific food consumption in the Canary Islands (Spain)†

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The consumption of specific functional foods (FF) and some determinants of FF item selection were assessed using a questionnaire administered to 1112 individuals in the Canary Islands (Spain). Food items considered were Milk products: easily digestible milk (or milk low in lactose), milk enriched with vitamins and/or minerals, skimmed milk with soluble fiber, milk with royal jelly, milk with modified fatty acids (omega 3), milk products low in fat, pro-biotic foods (yoghurt and fermented milk) and yoghurt with phytosterols; Cereals: fortified breakfast cereals, wholemeal cereals and energy bars; Drinks: juices and enriched drinks, stimulating drinks and isotonic drinks; DHA-enriched, low cholesterol eggs; Meat products: low salt sausages and cooked low fat ham; Fats: enriched margarine, margarine rich in phytosterols and sunflower oil rich in oleic acid; Condiments: iodated salt. These food items were organized into 7 FF groups (milk products, cereals, fortified drinks, DHA eggs, meat product, fats, condiments). The results indicated that the highest prevalence was fortified drinks (63.6%; 95%CI: 60.7–66.5). Overall FF consumption prevalence was 80.1% (95%CI: 77–83): single FF item consumption being rare. There were significant inter-group relationships, and some group intakes (milk products, cereals and drinks) were related to age but with no overall relationship between consumption and age. The education level was significantly related to the consumption of cereals, drinks, meat products and condiments (χ^2 test $p = 0.04$). Some specific FF item consumption segregated with environment (rural or urban) but with no overall significant relationship between the FF group and environment or gender.

1. Introduction

In the present study, we considered a specific group of food items within those termed "functional foods". The concept of functional foods (FF) originated in Japan.[1] In the 1980s, the Japanese healthcare authorities noted that it needed to control health costs generated by increased life expectancy of its progressively ageing population and needed to also guarantee a better quality of life.[2] A new concept of food was introduced that was developed specifically to improve health and reduce the risk of contracting diseases.[3]

There is no universal definition of FF, since what is implied is a concept that is more than a grouping of food items.[4,5] However, in general, FF consist of a new range of processed foods that contain biologically active compounds which, when included in human diets, offer benefits for health, or desirable physiological effects beyond that required of basic nutrition.[6,7] The Institute of Food Technologists (IFT) Expert Report defines FF as food items and food components that provide a health benefit beyond basic nutrition (for the intended population).[8] In the field of human nutrition, interest has gone beyond that of achieving an adequate and safe provision of foods to guarantee survival (*i.e.* sufficient nutrition) to the current emphasis on the potential of food to promote health (*i.e.* optimal nutrition). The sought after outcome is improved physical and mental well-being and a reduction in risk of chronic diseases and, as such, to improve the quality-of-life of the individual as well as of populations.[9]

In 2006, the European Union (EU) introduced important legislation (CE 1924/2006 European Parliament and Council)[10,11] regarding nutrition and the health properties of foods.

The vast amount of information on foods, nutrition, health, benefits of physical activity and reduction in disease risk has had an impact on the consumer's behavior in food item selection, since this is perceived as the pattern of good eating and health maintenance.[12,13]

There have been studies showing that it is difficult for the consumer to change habits, even when known to be unhealthy, while, at the same time, consumers are keen to subscribe to a healthy lifestyle, including the purchase of healthy foods.[14,15]

Reliance on foods that have more health benefits has been encouraged by socioeconomic and demographic changes in

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the population.[16,17] The increase in life expectancy has, as a consequence, increased the proportion of the elderly which, in combination with a desire to enjoy a better quality of life, has led to increases in health costs. Hence, governments, researchers, healthcare professionals and the food industry have sought ways to facilitate these changes in the most efficacious manner.[18]

Currently, there continue to be studies seeking a better definition of FF, their properties and effects on the physiological function of the human body.[19] To date, around 200 types of FF have been commercialized in Spain,[20] and experts calculate that this type of food will represent over the next few years a third of the global food market.[5]

1.1 Objective

The objective of the present study is to describe and analyze consumer behavior towards functional foods in the Canary Islands (Spain).[21] For methodological definition purposes only, the non-consumers encountered in the current questionnaire were omitted from the statistical analyses.

2. Subjects and materials

The study was performed in the islands of Gran Canaria, Lanzarote and Fuerteventura, with a total population of approximately 1 083 502 inhabitants (population level at the last census in 01/01/2009; Bureau of National Statistics). The fieldwork was conducted between the end of 2009 and the first trimester of 2010. Especially designed questionnaires were used focusing on general patterns of food consumption in the islands.

There were 1112 interviews conducted with individuals >18 years of age, of whom 59.3% were female and 40.7% were male. The mean age was 37.6 years (standard deviation SD: 13.7).

The study was descriptive, cross-sectional, multi-centered and randomized. In designing the protocol, the research group performed a literature search on FF.[22] The literature indicated that consumers are not very familiar with this type of product and hence the FF products available in the Canary Islands were summarized for clarity (see the Appendix). The questionnaire used was developed from that used by Delia Soto *et al.*[21] and modified with questions on consumption designed by Serra Majem and Aranceta Bartrina.[5] The questions explored 22 standard products organized into 7 groups:

Milk products: easily digestible milk (or milk low in lactose), milk enriched with vitamins and/or minerals, skimmed milk with soluble fiber, milk with royal jelly, milk with modified fatty acids (omega 3), milk products low in fat, pro-biotic foods (yoghurt and fermented milk) and yoghurt with phytosterols.

Cereals: fortified breakfast cereals, whole-meal cereals and energy bars.

Drinks: juices and enriched drinks, stimulating drinks and isotonic drinks.

Eggs: Docosahexanoic acid-enriched (DHA), low in cholesterol eggs.

Meat products: low salt sausages and cooked low fat ham.

Fats: enriched margarine, margarine rich in phytosterols and sunflower oil rich in oleic acid.

Condiments: iodated salt.

The questions had closed suggested responses and followed a frequency-of-consumption scale organized at 5 levels: never, about once a month, about once a week, several times a week and daily.

The concept of consumption prevalence was applied if a FF item (in the 7 categories described) was included in the weekly diet. The subject was described as a sporadic consumer if the food item (or category) was descried as being consumed "occasionally per month" (*i.e.* ingested 2 to 3 times a month).

The population sample was reasonably large and the data were collected in a specific geographic area. However, despite being representative of the population from which it was derived, we cannot know the representative nature of the data in relation to other populations with other cultural and culinary preferences.

2.1 Data analyses

The Wilcoxon test was used to compare numerical data. Multiple comparisons were performed using the Kruskal–Wallis test. Non-parametric correlations were used to evaluate relationships between numerical variables. Relationships between categorical variables were explored with the χ^2 test, or likelihood ratio. The degree of association was estimated using the odds ratio (OR). All confidence intervals are expressed as 95%. Significance was set at $p \leq 0.05$. The SPSS package (v. 18.0) was used throughout.

3. Results

Table 1 summarizes the descriptive analyses of the study sample segregated according to gender. The data were non-normally distributed and justified the use of non-parametric methods.

Table 2 summarizes the frequency of consumption of the 7 groups of products. Fig. 1 graphically presents the overall consumption in each group of FF items. The group with the highest consumption was that of the drinks (41.6%; 95%CI: 38.6–44.6), followed by cereals (30.7%; 95%CI: 27.7–33.7), milk products (29.2%; 95%CI: 26.2–32.2), meat products (29.2%; 95% CI: 26.2–32.2) and fats (12.7%; 95%CI: 9.7–15.7). The group of condiments (37.2%; 95%CI: 34.2–40.2) was represented by one product alone, iodated salt, and as such may not be representative. Eggs represented a low consumption of 6.7% (95%CI: 3.7–9.7).

Table 3 presents the consumption prevalence organized into 3 age categories. The groups of food items are presented in terms of prevalence or frequency relative to weekly consumption. In the first 3 groups of items (milk products, cereals and drinks), there was a clear correlation ($p < 0.01$) between each of these groups and age, *i.e.* the consumption of milk products increased with age while that of the other two groups decreased with age.

The consumption prevalence data indicated that FF groups not consumed represent 19.2% (95%CI: 16.1–22), consumption of only one block represented 29.7% (95%CI: 26.8–32.6) while the percentage consumption of the other groups continues to fall. The simultaneous consumption of any 2 groups = 20.1% (95% CI: 17–23), 3 groups = 14.6% (95%CI: 11.7–17.5), 4 groups = 8.4% (95%CI: 5.5–11.3), 5 groups = 4.9% (95%CI: 2–7.8) and

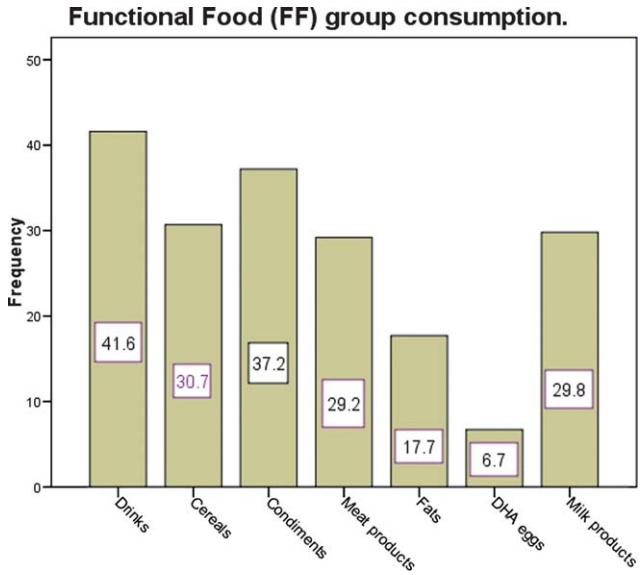

Fig. 1 Functional food group consumption.

6 groups = 1.7 (95%CI: 1.2–4.6). The "compulsive" consumers, *i.e.* those who subscribe to all the groups, represented only 0.7% (95%CI: 0.4–1) and the "sporadic" consumers, who consume an FF item only occasionally each month, represented 99.3% (95% CI: 96.2–100).

Of the 22 individual products, the consumption of enriched drinks in the weekly diet reached 63.6% (95%CI: 60.7–66.5) of consumers. The FF items with the lowest prevalence were the DHA eggs, *i.e.* included in the weekly diet in only 6.7% (95%CI: 3.9–9.7) of consumers.

The consumption of specific groups or products in relation to age, Table 4, has clear interest, not only in itself but also because of its capacity to reveal aspects of consumers' behavior.

Correlations were present in the majority of cases, not necessarily strong, but relatively safe ($p < 0.01$). Furthermore, practically all the groups were interrelated, without any significant segregation with age. The consumption of fortified drinks was outside the norm since it was the group that showed the lowest relationship. On further analysis, energy drinks were related with the consumption of other products, but the food items with the highest prevalence (enriched drinks) formed part of this group.

Socio-cultural determinants can be associated with FF consumption. In the present study, education level reflects the cultural level, and differences in consumption were noted in relation to education level (χ^2 test $p = 0.04$). These differences focused on cereals ($p < 0.01$), drinks ($p < 0.01$), meat products ($p = 0.046$) and condiments ($p = 0.03$), all with increasing consumption with increasing levels of education. Fat intake was associated with the consumer's awareness of the concept of FF

Table 1 Descriptive analysis of the variables in the study segregated with respect to gender[a,b]

Variable		Total ($n = 1121$)	Males 457 (40.8%)	Females 664 (59.3%)
Age:		37.64 ± 13.7	37.3 ± 13.9	37.9 ± 13.7
	<30 years	422 (37.6)	183 (39.7)	239 (36.1)
	Between 31 and 50 years	480 (42.8)	187 (40.8)	293 (44.4)
	>50 years	219 (19.6)	89 (19.5)	130 (19.6)
Environment:				
	Rural	473 (42.3)	207 (45.4)	266 (40.1)
	Urban	648 (52.7)	250 (54.6)	398 (59.1)
Knows the definition of AF:		411 (36.7)	154 (33.7)	271 (39.6)
Regular consumer:				
	Yes	867 (80.1)	350 (79.6)	515 (80.4)
	No	215 (19.9)	90 (20.4)	125 (19.4)
Education level:				
	Primary	222 (28.6)	127 (27.6)	199 (29.4)
	Secondary	431 (38.9)	181 (40)	250 (38.1)
	Tertiary	367 (32.5)	152 (32.4)	215 (32.5)

[a] The numerical variables are described as mean ± SD, the categorical variables as absolute numbers and the percentages given in parentheses. [b] Null hypotheses comparisons to detect differences showed a close-to-significant difference ($p = 0.08$) with respect to gender and in the consumer's awareness of the definition of FF ($p = 0.05$). The study sample was sufficiently homogenous for any significant result not to be due to sample bias.

Table 2 Consumption of FF groups[a]

Product frequency	Milk	Cereals	Drinks	DHA eggs	Meat products	Fats	Condiments
Never	704 (63)	547 (49)	401 (37)	942 (87.1)	573 (52.9)	782 (72.2)	606 (56)
Occasionally per month	81 (7.8)	227 (20.3)	232 (21.4)	67 (6.2)	194 (17.9)	163 (15.1)	74 (6.8)
Occasionally per week	95 (8.5)	119 (10.7)	149 (13.8)	38 (3.5)	148 (13.7)	56 (5.2)	118 (10.9)
Several times a week	81 (7.8)	112 (10)	153 (14.1)	30 (2.8)	122 (11.3)	38 (3.5)	82 (7.6)
Daily	144 (12.9)	112 (10)	148 (13.7)	5 (0.5)	46 (4.2)	43 (4)	203 (18.7)

[a] Consumption data expressed as absolute numbers of individuals and percentage of the total in parentheses.

(χ^2 test $p < 0.01$). Of note in Table 1 is that women were the better informed regarding the concept of FF (χ^2 test $p < 0.05$; OR 1.107; 95%CI: 1.002–1.224), although there were no significant differences with respect to consumption and gender (likelihood ratio $p = 0.68$).

Environment (urban or rural) was not related to overall consumption (likelihood ratio $p = 0.12$) but there were significant differences with respect to some FF groups over environment and education level. These data are summarized in Table 5. Cereals and enriched drinks had a higher consumption in the urban environment at all education levels, while the opposite was observed with respect to meat products. In those individuals with higher education levels, there was a disparity with respect to condiments and DHA eggs; the higher consumption level being in the urban environment. The OR, although high, are highly statistically significant, with no single confidence interval containing unity; a clear confirmation of association.

In general, consumption was not associated with age (likelihood ratio $p = 0.27$) although some of the FF groups were significant related to age (Table 3).

Table 3 Prevalence of FF consumption segregated by food group and age

FF group	Age group	Percentage consumption prevalence (95%CI)
Milk products [a]	<30 years	21.9 (11.9–31.9)
	Between 31 and 50	33.2 (36.4–41)
	>50 years	37.2 (26.2–48.2)
	Overall	**29.2 (23.8–34.6)**
Cereals [a]	<30 years	38.3 (30.6–46)
	Between 31 and 50	28.4 (36.8–20)
	>50 years	20.6 (6–35.2)
	Overall	**30.7 (35.4–36)**
Drinks [a]	<30 years	50.9 (44.1–57.5)
	Between 31 and 50	39.6 (30.8–38.2)
	>50 years	28.1 (15.5–40.7)
	Overall	**41.6 (37–46.2)**
DHA eggs	<30 years	6.6 (0–25.1)
	Between 31 and 50	7.2 (0–24)
	>50 years	5.2 (0–40.5)
	Overall	**6.7 (3.9–9.7)**
Meat products	<30 years	25.7 (16.2–35.2)
	Between 31 and 50	31.5 (23.4–39.6)
	>50 years	31 (18.8–43.2)
	Overall	**29.2 (23.7–34.7)**
Fats	<30 years	12.2 (0–25.7)
	Between 31 and 50	14.4 (2.4–26)
	>50 years	9 (0–31.5)
	Overall	**12.7 (8.4–23.1)**
Condiments	<30 years	38.9 (31.2–46.6)
	Between 31 and 50	36.8 (31.1–44.5)
	>50 years	34.8 (23.3–46.3)
	Overall	**37.2 (32.7–42.1)**
	<30 years	84.1 (79.4–88.8)
	Between 31 and 50	77.5 (73.1–81.9)
	>50 years	78.6 (72–85.2)
	Prevalence	**80.1 (77–83)**

[a] Significant correlation ($p < 0.01$) [non-parametric test]. To be considered a consumer item requires at least one of the 7 groups to be included in the weekly diet.

Table 4 Correlation (non-parametric) between groups of FF

	Cereals	Drinks	DHA eggs	Meat products	Fats	Condiments
Milk products						
<30 years	0.34[b]	0.23[b]	0.21[b]	0.17[b]	0.20[b]	0.12[a]
Between 31 and 50	0.42[b]	0.24[b]	0.21[b]	0.27[b]	0.34[b]	0.20[b]
>50 years	0.33[b]	0.10[a]	NS[c]	0.37[b]	0.24[b]	0.17[a]
Overall	0.35[b]	0.19[b]	0.17[b]	0.26[b]	0.26[b]	0.16[b]
Cereals						
<30 years		0.20[b]	0.10[a]	0.21[b]	0.18[b]	0.11[b]
Between 31 and 50		0.09[a]	0.23[b]	0.31[b]	0.22[b]	0.23[b]
>50 years		NS[c]	0.27[b]	0.28[b]	0.16[a]	0.25[b]
Overall		0.12[b]	0.17[b]	0.26[b]	0.18[b]	0.20[b]
Drinks						
<30 years			NS[c]	NS[c]	0.14[a]	NS[c]
Between 31 and 50			0.18[b]	0.10[a]	0.20[b]	NS[c]
>50 years			NS[c]	NS[c]	0.15[a]	NS[c]
Overall			NS[c]	NS[c]	0.17[b]	NS[c]
DHA eggs						
<30 years				0.21[b]	0.18[b]	0.14[b]
Between 31 and 50				0.18[b]	0.15[b]	0.24[b]
>50 years				0.14[a]	NS[c]	0.24[b]
Overall				0.17[b]	0.13[b]	0.23[b]
Meat products						
<30 years					0.23[b]	0.15[b]
Between 31 and 50					0.31[b]	0.28[b]
>50 years					0.15[b]	0.21[b]
Overall					0.24[b]	0.22[b]
Fats						
<30 years						0.22[b]
Between 31 and 50						0.31 [b]
>50 years						NS[c]
Overall						0.24[b]

[a] $p < 0.05$. [b] $p < 0.01$. [c] NS = Not significant.

Table 5 Differences in FF groups in relation to environment and education levels

Consumer's education level	FF group	Environment (percentage consumption (rural/urban))	*P* value	OR (95%CI)
Primary	Cereals	18.9/25.9	0.09[a]	1.26 (0.91–1.75)
	Drinks	25.9/37.1	0.02	1.68 (1.02–2.76)
	Meat products	40.3/27.6	0.01	1.31 (1.04–1.67)
Secondary	Milk products	32.4/22.7	0.02	1.24 (1.01–1.53)
	Cereals	35.8/28.5	0.07[a]	1.16 (0.96–1.40)
	Meat products	37.117.7	<0.001	1.63 (1.26–2.09)
Tertiary	Cereals	28.640.4	0.02	1.69 (1.06–2.70)
	Drinks	31.8/41.7	0.04	1.54 (0.97–2.43)
	DHA eggs	4.5/10.7	0.03	2.52 (0.99–6.40)
	Condiments	25/46.6	<0.01	2.72 (1.68–4.40)

[a] Almost significant.

4. Discussion

The prevalence of FF in the weekly diet is very high (80.1%; 95% CI: 77–83) and if we take the wider criteria of consumption, *i.e.* at least one FF item consumed per month, the consumption is practically 100% (mean: 99.3%; 95%CI: 96.2–100).

The food items that are of considerable note are contained in the groups of drinks, cereals and milk products; all 3 having significant changes with age. The greater consumption of items integrated within the drinks and their decrease with age are due to this block being composed of fruit juices (enriched with vitamins and related to childhood), together with stimulating and isotonic drinks related to sport and gymnastics.

The consumption of milk products increases with age and could be due to benefits regarding hypercholesterolemia, as has been postulated by Frewer *et al.*[23] However, a decrease is observed in the consumption of cereals with age, probably related to infancy and subsequent weight maintenance in young adolescents.

FF items are interrelated in terms of consumption. The consumer rarely consumes a single product or single group of FF products. Generally, the overall tendency is to incorporate this type of food into the standard diet.[24,25] This is supported by the many relationships observed between groups and products. Of note is that this is not a chain effect, since the percentage of consumers of more than one group is clearly downward, except for the drinks group. In terms of the social-cultural aspect, of note is that the items derived from new technologies (such as DHA eggs or milk products) are consumed more in the urban environment, together with cereals and condiments such as iodated salt. In the rural environment, conversely, more processed meats are consumed. Perhaps, the lower consumption of the other FF in the rural environment is due to self-sufficiency on the part of the farmer, who consumes his own produce and functional cereals being substituted by roasted maize meal (a special drink of the Canary Islands). As such, it can be reasoned that those living in an urban environment are more aware of the health benefits offered by FF, while their own traditional products are more valued by those living in a rural environment. Individuals with higher levels of education are greater consumers of FF, and this may reflect the availability of information on this type of product to the educated urban dweller. These results coincide with the findings of other studies.[26]

Women are more informed, although no statistically significant differences were observed in consumer behavior in relation to gender.[26]

FF, when part of a balanced diet and accompanied by a healthy lifestyle, can offer improved health and/or the prevention of certain diseases.[27] The health issue prompted the European Union in the European Parliament Regulations to promote the nutritional values and health properties of FF items.[11]

Currently, the biggest challenge for the scientific community is to investigate the nutritional options, and evaluate the relationships between food items (or components), improved health status and reduced disease.[28,29] It is also vital to communicate to consumers the health benefits that accrue, such that the consumer is better informed and can make a better selection of FF items for inclusion into a healthy diet.[16]

A limitation of the current study is that, despite the large population sample, the findings relate only to the population of the Canary Islands. Similarly, the consumption frequencies need to be considered as approximate.

There is a need for further investigations into this type of alimentation so that the production of FF is more rapid.[30] There are many unanswered questions,[31] such as the appropriate quantity of nutrients contained in the products, the bioavailability, the amount needed to be ingested to achieve a positive effect and the negative risks or toxicity if taken in excess.[32] Hence, although FF can improve health, there needs to be a more systematic evaluation of the appropriate quantities for health benefits. Although FF intake may not be a universal panacea for all illnesses, the outcomes are beneficial and provide health benefits within an appropriate, and balanced, diet.[33]

Appendices

Questionnaire arrangement of FF items and closed responses.

Indicate your usual consumption of FF in the list below:

1: never; 2: very rarely; 3: occasionally/month; 4: occasionally/week; 5: several times/week; 6: daily.

- Milk products
- Milk for digestion intolerance (*e.g.* low lactose)
- Milk enriched in vitamins and/or minerals
- Skimmed milk
- Milk with added soluble fiber
- Milk with added royal jelly
- Milk with modified omega 3 fatty acid
- Low fat milk
- Probiotic milk products (yoghurt, fermented milk)
- Yoghurt with added phytosterols
- Cereals
- Fortified drinks
- DHA eggs
- Meat products
- Fats
- Low calories
- Condiments

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References

1 S. Arai, Global view on functional foods: Asian perspectives, *Br. J. Nutr.*, 2002, **88**(S2), S139–S143.
2 A. T. Diplock, P. J. Aggett, M. Ashwell, F. Bornet, E. B. Fern and M. Roberfroid, Scientific concepts of functional foods in Europe: consensus document, *Br. J. Nutr.*, 1999, **81**, S1–S27.
3 P. Farjas Abadía, Sobre los alimentos funcionales, *Rev. Esp. Salud Publica*, 2003, **77**, 313–316.
4 B. Gonzalvo-Heras, B. Raidó-Quintana and L. Serra-Majem, Alimentos funcionales: concepto y posibilidades de aplicación, *Alimentación, Nutrición y Salud*, 2006, **8**, 44–49.
5 L. L. Serra Majem and J. Aranceta Bartrina, *Guía de la alimentación funcional*, Elsevier–Masson, Barcelona, 2008, pp. 25–33.
6 M. B. Roberfroid, Concepts and new strategy of functional food science: the European perspective, *Am. J. Clin. Nutr.*, 2000, **71** (suppl.), 1660S–1664S.
7 M. B. Roberfroid, Prebioticins and probiotics: are they functional foods? *Am. J. Clin. Nutr.*, 2000, **71**(suppl.), 1682S–1687S.
8 Institute of Food Technologies (IFT), *Export Report Functional Foods: Opportunities and Challenges*, Marketing functional foods, December 2006.

9 J. Aranceta Bartrina, Es necesario incluir alimentos funcionales en nuestra alimentación? *Rev. Nutr. Pract.*, 2002, **6**, 47–50.
10 , European Commission Community Research Project Report (2000), Functional Food Science in Europe, Volume 1, Functional Food Science in Europe, Volume 2, Scientific Concepts of Functional Foods in Europe, Volume 3, EUR-18591, Office for Official Publications of the European Communities, L-2985, Luxembourg. ILSI Europe Concise Monograph: Concepts of Functional Foods.
11 European Parliament and Council (2007), Corrigendum to Regulation (EC) No. 1924/2006 of the European Parliament and of the Council of 20th December 2006 on nutrition and health claims made on foods, *Official J. Eur. Union*, L404, 30 December 2006, published 18 January 2007.
12 M. Ashwell, Functional foods: a simple scheme for establishing the scientific basis for all claims, *Public Health Nutr.*, 2001, **4**, 859–863.
13 C. M. Hasler, Functional foods: the Western perspectives, *Nutr. Rev.*, 1996, **54**, S6–S10.
14 L. Bredahl, Determinants of consumer attitudes and purchase intentions with regard to genetically modified foods. Results of a cross-national survey, *MAPP Working Paper*, 2000, **69**.
15 L. Bredahl, Determinants of consumer attitudes and purchase intentions with regard to genetically modified foods: Results of a cross-national survey, *J. Consum. Policy*, 2001, **24**, 23–61.
16 L. Bello Acebron and D. Calvo, Attitudes towards buying fresh mussels, *J. Food Prod. Marketing*, 1999, **5**, 49–63.
17 C. M. Hasler, Functional foods: their role in disease prevention and health promotion, *Food Technol.*, 1998, **52**, 63–70.
18 F. Bellisle, S. T. Diplock, G. Hornstra, B. Koletzko, M. Roberfroid, S. Salminen and W. H. M. Saris, Functional food science in Europe, *Br. J. Nutr.*, 1998, **80**(Suppl. 1), S1–S193.
19 C. M. Hasler, Functional foods: benefits, concerns and challenges – a position paper from the American Council on Science and Health, *J. Nutr.*, 2000, **132**, 3772–3781.
20 I. Díaz Yubero, Los nuevos alimentos, *Distribución y Consumo, Enero-Febrero*, 2003, 65–71.
21 D. S. Alvarez, E. Wittig de Penna, L. Guerrero, F. Garrido and R. Fuenzalida, Functional foods: behavior of the Chilean consumer, *Revista Chilena de Nutrición*, 2006, **33**(1), 43–54.
22 J. Bogue, T. Coleman and D. Sorenson, Determinants of consumers' dietary behaviour for health-enhancing foods, *Br. Food J.*, 2005, **107**, 4–16.
23 L. Frewer, J. Scholderer and N. Lambert, Consumer acceptance of functional foods: issues for the future, *Br. Food J.*, 2003, **105**, 714–731.
24 I. Ajzen, The theory of planned behavior, *Org. Behav. Hum. Dec. Proc.*, 1991, **50**, 179–211.
25 C. T. Allen, K. A. Machleit and S. S. Kleine, A comparison of attitudes and emotions as predictors of behavior at diverse levels of behavioral experience, *J. Consum. Res.*, 1992, **18**, 493–504.
26 F. J. Sánchez-Muniz, II, Alimentos funcionales: carne y derivados cárnicos. Presente y perspectivas, in *La Carne y Productos Cárnicos como Alimentos Funcionales*, ed. F. Jiménez Colmenero, F. J. Sánchez-Muñiz and B. Olmedilla, Fundación Española de la Nutrición, Madrid, 2004, pp. 41–55.
27 J. Bello, Los alimentos funcionales nutracéuticos: Funciones saludables de algunos componentes de los alimentos, *Alimentaria*, 1995, **33**, 49–58.
28 P. J. Aggett, M. Ashwell, F. Bornet, A. T. Diplock, E. B. Fern and M. B. Roberfroid, Scientific concepts of functional foods in Europe: consensus document, *Br. J. Nutr.*, 1999, **81**(Suppl. 1), S1–S27.
29 L. Contor, Functional food science in Europe, *Nutr. Metab. Cardiovasc. Dis.*, 2001, **11**(suppl. 4), 20–23.
30 A. V. Cardello, Consumer concerns and expectations about novel food processing technologies: effects on product liking, *Appetite*, 2003, **40**, 217–233.
31 G. Pascal, Functional foods – the future: How to regulate these foods, *Nutr. Rev.*, 1996, **54**, S199–S201.
32 B. Caballero, Nutritional implications of dietary interactions, *Food Nutr. Bull.*, 1998, **10**, 9–20.
33 S. Arai, Functional food science in Japan: state of the art, *BioFactors*, 2000, **12**, 13–16.

