

Review

Food safety and food labeling from the viewpoint of the consumers

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Distrust of food safety has grown among the Japanese people after the occurrence of bovine spongiform encephalitis (BSE) in 2001. The Food Safety Commission was formed under the Cabinet Office and made a network among the ministries. The newly-established Consumer Agency may strengthen the quick response to emergencies. *Shoku-iku* (food and dietary education) Law is being implemented by the Cabinet Office with cooperation from relevant ministries and NGOs. Food Sanitation Law and Health Promotion Law are briefly explained, and the necessity of functional nutriology for non-nutrient biologically active substances is described. With regard to public health nutrition, a new food label showing energy balance and antioxidant unit (AOU) as a surrogate marker of fruit and vegetables has been developed for tailor-made nutrition which makes it easy to for individuals to control energy intake.

Key Words: food safety, food for specified use (FOSHU), functional nutriology, functional food factor (FFF), food labelling

FOOD SAFETY COMMISSION: NETWORK BETWEEN THE MINISTRY OF HEALTH, LABOUR AND WELFARE, MINISTRY OF AGRICULTURE, FORESTRY AND FISHERY, AND CABINET OFFICE

Distrust of food safety has grown among the Japanese people, triggered by various problems beginning with the occurrence of bovine spongiform encephalitis (BSE) in 2001. In response, Japan enacted the Basic Law on Food Safety, a comprehensive law to ensure food safety for the purpose of protecting the health of the nation. Through the development of related laws, Japan has introduced a risk analysis approach as well as a precautionary strategy to the food safety network (Figure 1).¹

Risk assessments are conducted by the Food Safety Commission established under the Basic Law on Food Safety. The approach aims to scientifically assess risks, expressed as the probability and degree of adverse health effects, and develop necessary measures based on the risk assessment. The Food Safety Commission is an organization that undertakes risk assessment, and is independent from risk management organizations such as the Ministry of Agriculture, Forestry and Fisheries, as well as the Ministry of Health, Labour and Welfare. Risk assessment, risk management, and risk communication are a set of solution oriented strategies conducted by exchanging information between the above Food Safety Commission and Ministries. A newly established Consumer Agency should be able to provide early response to an emergency.

THE FOOD SANITATION LAW

In 1947, The Ministry of Health and Welfare (MHLW) enacted the Food Sanitation Law as the first comprehensive law for food safety and hygiene.² All food additives

have been regulated by this law, and only additives designated as safe by the MHLW are allowed to be used in foods. At first, only chemically synthesized additives were designated, but currently, all types of additives are included under the positive list system. Currently, 345 additives and 46 substances are designated as approved food additives by the MHLW.

The Food Sanitation Law covers various responsibilities such as: the establishment of standards/specifications for food, additives, apparatus, and food containers/ packages; inspection to assess whether these established standards are met; hygiene management of the manufacture process and sale of food; and business licensing. The Abattoir Law and the Poultry Slaughtering Business Control and Poultry Inspection Law cover the regulation of livestock and poultry, including inspection systems for meat. Imported foods are inspected by 31 quarantine stations placed across Japan under the central government.

Local governments and health centres also play an important role. The local governments share responsibilities to conduct inspection of and give advice to food-related businesses.

In recent years the global food trade has been increasing, and imported foods occupy nearly 60 percent of the

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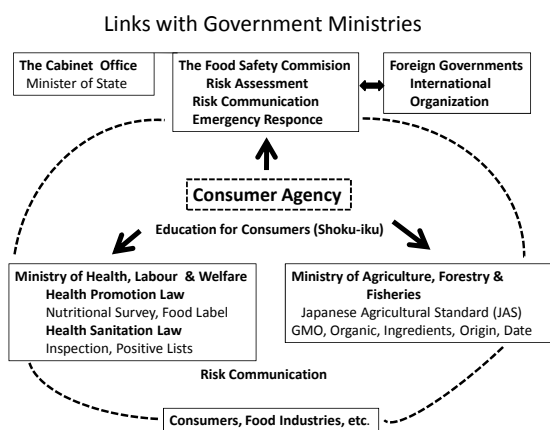


Figure 1. Safety Network of Food Safety Commission. Links between Government Ministries

Japanese market. Also, there is a growing possibility that imported foods contain food additives that are unauthorized in Japan. Safety assessments, conducted by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) will facilitate international harmonization of substances that are internationally proven safe and widely used in the world.³⁻⁶

Ingredients which make up only a small portion of a product may be omitted under JAS Law. Allergenic substances, however, require labelling under the Food Sanitation Law. Mandatory labelling is required at the distribution stage, and is mandatory for eggs, milk, wheat, buckwheat and peanuts, and recommended for abalone, squid, salmon roe, shrimp/prawn, oranges, crab, kiwifruit, beef, tree nuts, salmon, mackerel, soybeans, chicken (poultry), pork, mushrooms, peaches, yams, apples and gelatine.

HEALTH PROMOTION LAW OF MHLW

The “Healthy Japan 21” program was implemented at the beginning of 21st century to prevent life-style related diseases, such as cancer, cardiovascular disease, diabetes mellitus, and hypertension.² The Health Promotion Law

supports this program. Foods with Health Claims refers to foods that comply with the specifications and standards established by the MHLW and are labelled as having certain nutritional or health functions. These foods are categorized into two groups: Foods with Nutrient Function Claims (FNFC) and Foods for Specified Health Uses (FOSHU).

The former includes foods that contain vitamins and minerals as nutritional ingredients, and the latter are foods officially approved to claim physiological effects on the human body.

FOODS FOR SPECIFIED HEALTH USES (FOSHU)

In 1992, MHLW established “FOSHU” that allows health claims on packaging (Figure.2). Japanese researchers refer to these as “Functional foods”.⁷⁻⁹ FOSHU approval requires scientific evidence of the effectiveness proved by clinical studies, additional safety studies to prove no side effects by oral intake, and exact determination of the specific effective components in foods.

Categories, functional factors and Health Claims for FOSHU are as follows:^{2,10}

1. GI (Gastro-intestinal) condition: Carbohydrate, such as oligosaccharides, dietary fiber and chitosan; “Helps maintain a good GI condition.”
2. Blood pressure: Lacto-tripeptide from fermented milk, dodecapeptide from casein, a group of peptides from sardine and soy protein; “Suitable for people with mild high blood pressure.”
3. Serum cholesterol: Soy protein, chitosan, low molecule sodium alginate and phytosterol “Helps decrease serum cholesterol level.”
4. Blood glucose: Indigestible dextrin, wheat albumin, L-arabinose etc.; “Helpful for those who are concerned about their blood glucose level.”
5. Absorption of minerals: Fructo-oligosaccharides, caseinphospho peptide; “Improves absorption of calcium.” Heme iron from hemoglobin; “Suitable for people with mild iron deficiency anemia.”
6. Blood neutral fat: Diacylglycerol and globin degradation product, EPA, DHA; “Helps reduce postprandial

The Regulation System of Food with Health Claims

	Medicine	Food	(Usual Food)
1952 (Foods for Special Dietary Uses)			
1991	Medicine	FOSHU	(So called Health Food) (Usual Food)
1995/6 (Nutrition Labeling Standards) (Foods for Special Dietary Uses)			
2001	Medicine	Food with Health Claims(FHC) FNFC (Nutrient Function Claim) FOSHU (Specified Health Uses)	(So called Health Food) (Usual Food)
(Foods for Special Dietary Uses)			
2005	Medicine	Food with Health Claims(FHC) FNFC (Nutrient Function Claim) Ordinary FOSHU Newtype of FOSHU (Standardized, Reduction of disease risk)	(So called Health Food) (Usual Food)

Figure 2. Changes of the regulation system of food with health claims.

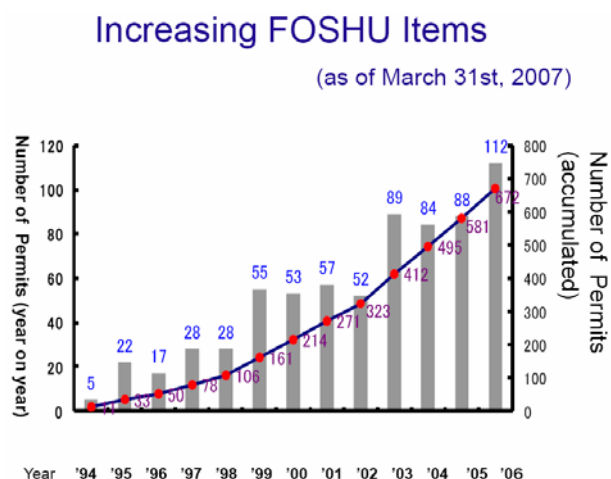


Figure 3. Increasing FOSHU items as of March 31st, 2007

blood triglyceride levels.” “Makes it difficult for fat to cling to the body.”

- Dental health: Some sugar alcohols such as xylitol, maltitol, erythritol, and palatinose (low cariogenic). Green tea polyphenol (non-cariogenic). “This is a low- or non-cariogenic product.” “Makes teeth strong and healthy.”
- Bone health: Microorganisms producing high quantities of Vitamin K2, and soy isoflavone. “Promote bone calcification.”

Food for Special Dietary Uses (FOSDU) refer to foods that are approved and permitted to display that the food is appropriate for specified dietary use. There are five categories of FOSDU: Formulas for pregnant or lactating women, Infant formulas, Foods for the elderly who have difficulty in masticating or swallowing, Medical foods for the ill.

NECESSITY OF FUNCTIONAL FOOD FACTOR (FFF) DATA-BASE AND FUNCTIONAL NUTRIOLOGY

The market for supplements as well as FOSHU is expanding, and more than 700 supplements are designated as FOSHU at the end of 2007 (Figure 3). Accordingly, reports of adverse effects are increasing. We made a database in NIH Safety Net containing 1956 cases of adverse effects associated with taking so-called healthy foods, in which 728 were considered to be due to allergic constitution, 456 were due to long-term or excess intake, and 334 were due to interactions with other medicine.¹⁰

Problems with supplements are differences between in vivo and in vitro effects, differences between product information and those of raw materials, variable quality of natural products due to lack of standards, insufficient data about long term use, and insufficient data about safety for diseased people.

Ingredients in FOSHU and other supplements vary, and functional substances in foods include phytochemicals, certain lipids, amino acids and peptides. Most of these are not ordinary nutrients. It is expected that insufficient intake of macro- and micro-nutrients will result in various physiological manifestations of disease, but nutraceuticals such as FOSHU are expected to have more

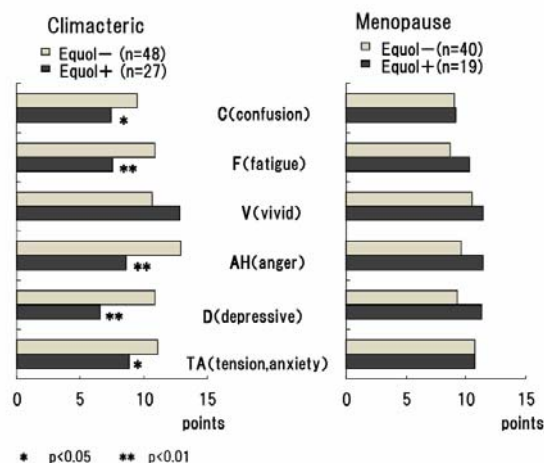


Figure 4. Profile of Mood States (POMS) feeling test scores in relation to equol producibility. Climacteric women, age 40-49.¹⁴

subtle pharmacological effects. A good example are phytoestrogens, which are believed to be beneficial for maintaining bone density and reducing climacteric symptoms.^{11,12}

Antioxidants, however, may prevent cancer and cardiovascular disease,⁹ but the necessary doses remain unknown. As with the undesirable interaction between grapefruit and warfarin, unknown interactions between nutraceuticals, drugs and macromolecules inside the body suggest a cautious approach.

Thus, we constructed a database to estimate phytochemical intake from the whole diet; current data allows more than 80 percent this intake to be classified and accounted for.¹³ Isoflavone intake by the Japanese is very high (Median=15-20 mg) compared to other nations. Recently attention has been called to the isoflavone metabolite equol, because of its stronger estrogenic action. The ability to metabolize daidzein to equol depends on the presence of a certain type of intestinal bacteria. More than half of the older Japanese population can convert daidzein to equol, but this percentage drops to 20-30 percent among the younger generation. Equol producers appear to have differential health profiles (Figure 4). Equol producers showed less severe psychological climacteric symptoms.¹⁴ Caucasians exhibit lower equol producer prevalence rates, so the expected estrogenic effect of isoflavones may differ across populations as well between individuals.

Effective doses of phytochemicals or nutraceuticals can be summarized in a standard table. Large doses of a particular vitamin may cause pharmacological effects, like vitamin C. Such evidence is conceptualized as “Functional Nutriology” in which nutritional or dietary therapy, and use of supplements, effectively makes a bridge to medical treatment (Figure 5). Food industries would benefit by developing supplements, and excluding false or dangerous so-called healthy foods from the market.

TAILOR MADE NUTITION FOR PUBLIC HEALTH

The epidemic increase of obesity in the world mostly results from over-eating of high energy density foods, although several single-nucleotide polymorphisms (SNPs) are considered to influence energy metabolism. Proper

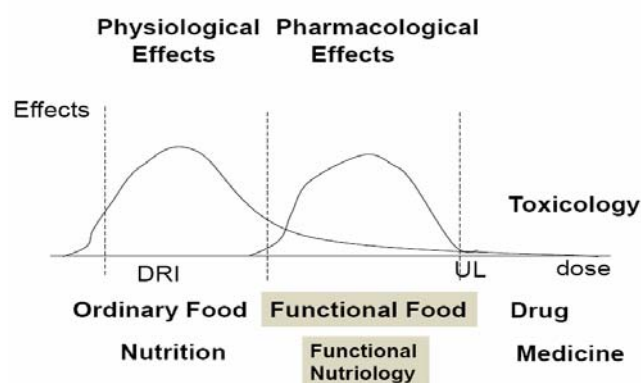


Figure 5. Concept of functional nutriology

energy intake and physical activity are the most important factors controlling obesity. If energy intake is successfully controlled, other nutrient recommendations can be easily followed. In Japan, a portion size of 80 kcal is a unit widely used for diabetic patients. We have defined a new energy unit (E-unit), as the energy required to melt 1 Kg of ice. Coincidentally it corresponds with a portion size of 80 kcal.

A healthy adult with average activity level requires [body weight (kg) x 0.4] E-units and an active person needs [body weight x 0.5] E-units. For example, a 60 kg man needs 24 E-units, so 8 E-units should be consumed at



Figure 6. Food icon on the menu, showing Energy and composition of C, P, F and antioxidant unit (AOU) as a surrogate marker of fruit and vegetables. C; carbohydrate, P; protein, L; lipid, AO; antioxidant unit.

breakfast, lunch and dinner. In children and adolescents, the body weight multiplier is 1.0 for 10-19 kg body weight, 0.9 for 20-29 kg, 0.8 for 30-39 kg, 0.7 for 40-49 kg, 0.6 for 50-59 kg, and 0.5 for 60-69 kg. The calculated values fit well with those of the dietary reference intake 2010.¹⁵ Desired body weight can be used for the calculation if an individual is overweight or underweight.

If E-units are shown on food labels and restaurant menus, and become popular, this would facilitate control

Table 1. Recommended energy intake by DRI2010 in Japan and calculated energy intake by E-unit system

	Age range	Recommended Energy Intake by PA			kg ^{*1}	Energy Intake by E-unit System		
		PAI	PAII	PAIII		Factor	b.w.*0.4	b.w.*0.5
Male	0-5M		550					
	6-8M		650					
	9-11M		700					
	1-2Y		1000		11.7	1.0	936	
	3-5Y		1330		16.2	1.0	1296	
	6-7Y	1350	1550	1700	22.0	0.9	1584	
	8-9Y	1600	1800	2050	27.5	0.9	1980	
	10-11Y	1950	2250	2500	35.5	0.8	2272	
	12-14Y	2200	2500	2750	48.0	0.7	2688	
	15-17Y	2450	2750	3100	58.4	0.6	2803	
	18-28Y	2250	2650	3000	63.0	0.5	2520	2520
	30-49Y	2300	2650	3050	68.5	0.4	2192	2740
	50-69Y	2100	2450	2800	65.0	0.4	2080	2600
70<	1850	2200	2500	59.7	0.4	1910	2388	
Female	0-5M		500					
	6-8M		600					
	9-11M		650					
	1-2Y		900		11.0	1.0	880	
	3-5Y		1250		16.2	1.0	1296	
	6-7Y	1250	1450	1650	22.0	0.9	1584	
	8-9Y	1500	1700	1900	27.2	0.9	1958	
	10-11Y	1750	2000	2250	34.5	0.8	2208	
	12-14Y	2000	2250	2550	46.0	0.7	2576	
	15-17Y	2000	2250	2500	50.6	0.6	2429	
	18-28Y	1700	1950	2250	50.6	0.5	2024	2024
	30-49Y	1750	2000	2300	53.0	0.4	1696	2120
	50-69Y	1650	1950	2200	53.6	0.4	1715	2144
70<	1450	1700	2000	49.0	0.4	1568	1960	

Recommended energy intake by physical activity (PA) is referred from DRI2010

^{*1}Standard body weight in DRI2010 in Japan²

Energy is expressed by calorie in the table.

of energy intake for all people (Figure 6). It may be necessary to include E-unit in the standardization and proper quality of agricultural and forestry products (JAS Law), because all consumables (food and beverages) for general consumers are subject to quality standards. This E-unit would be very useful for consumers when choosing between foods. This new energy unit and system was created in response to requests for unified and simplified of foods. This was viewed as necessary due to the diversification of food products resulting from increased imports and new foods on the one hand and rising consumer concerns about diet on the other.

CONCLUDING REMARK

The Food Safety Commission has developed a linkage between the Cabinet Office, Ministry of Health, Labour and Welfare, Ministry of Agriculture, Forestry and Fishery, and the International Organization for analysing information and scientifically assess risks. Shoku-iku (Food and dietary education throughout life) is effective to educate people. The newly established consumer agency should enable faster response to emergencies. A new food labeling system is necessary for producers, providers and consumers so that a healthier society can be formed where we would employ a new energy-unit (80 kcal) for individual energy and nutrient intake as tailor-made nutrition.

AUTHOR DISCLOSURES

Any of the authors does not have conflict with any company.

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由消費者的觀點來看食品安全與食品標示

在 2001 年發生狂牛症事件之後，日本民衆漸漸開始質疑食品的安全性。於是日本在內閣府下成立食品安全委員會並且在各部會之間組成一個連繫網路。新成立的消費者服務處加強對緊急事件的快速回應。內閣府與相關部會及非政府組織合作執行食品教育(食品及膳食教育)法。本文對日本食品衛生法及健康促進法做簡短的說明，並敘述功能性營養學的必要性，以研究非營養但具生物活性的物質。關於公共衛生營養，依個體需要而設計的營養已發展出一種新的食品標示，可以顯示熱量平衡及用抗氧化單位(AOU)作為水果及蔬菜的替代指標，這可使每個人更容易控制熱量攝取。

關鍵字：食品安全、特定保健食品(FOSHU)、功能性營養學、功能性食品因子(FFF)、食品標示