

How Food Could Function

The issue of “food functionality” has been attracting attention around the world. **Ryu Arakawa** hears what Tojiro Tsushida, chief of the National Food Research Institute at the National Agriculture and Food Research Organization and a leading authority on food functionality research, has to say on the matter.

Japan is now said to be the world’s most rapidly aging society, with a rate of aging surpassing 21% in 2007. From April 2008, specific health guidance became compulsory for those covered by health insurance whose medical examination results indicate that they have metabolic syndrome, or incipient metabolic syndrome. Added to this, the problem of contaminated foods and imported agricultural produce, which has been a frequent occurrence in recent years, has brought major confusion and anxiety to the Japanese dining table.

As a result, food security and safety and the issue of Japan’s low food sufficiency ratio, together with increased demand for foods and dietary habits that have health benefits, have seen a renewed focus of interest among citizens. However, we cannot

expect a swift solution to either of these issues.

“We can, however, advance improvements in citizens’ health and contribute to the revitalization of the regions, while at the same time steadily boosting the food sufficiency ratio, by focusing on the functionality that food possesses, providing new added value to regional homegrown agricultural produce and providing incentives for growers to cultivate them.”

So says Tojiro Tsushida, chief of the National Food Research Institute National Agriculture and Food Research Organization.

According to Tsushida, there are three food functions; namely, nutrition, good taste and the bio-regulating function that maintains the bodily functions of the person ingesting the food. The National Food Research Institute, where Tsushida works,

began research in earnest in 1987 on the theme of food functionality which has benefits for the dietary habits of citizens. It also looked at the

third function: the bio-regulating function. It was the first project of its kind in the world.

“In domestic production, food is cultivated in front of the eyes of the public, so the security and safety of food is guaranteed. Even if mass-production of regional agricultural produce is difficult, the added value of food functionality would enable us to encourage the local consumption of locally produced goods through cultivation incentives in rural areas, and to contribute to the revitalization of regional economies, allowing us to raise our food sufficiency ratio over the long term,” says Tsushida.

This research plays a role in the Ministry of Agriculture, Forestry and Fisheries’ (MAFF) Food General Project Study. In FY2007 high priority was given to the advancement, standardization, and dissemination of food functionality evaluation technology. In terms of its dissemination, the deployment of the technology to the Food Industry Cluster Promotion Project implemented by the MAFF General Foods Bureau is already proving successful. As Tsushida points out, cultivation incentives for foods that possess functional properties offer real examples that contribute to regional revitalization.

Tsushida describes the individual functional properties of foods, but here he brings up the pioneering example of the national Kyoyasai brand of deli-



“There is a need to protect regional agricultural produce as a resource by fostering locally produced and locally consumed brand products.”

—Tojiro Tsushida, chief of the National Food Research Institute

cious vegetables produced in Kyoto.

“Every region of Japan has its famous fresh produce, even if this produce is not as famous as Kyoyasai. The added value of food functionality found in these foods should be identified, and incentives provided for their cultivation at the regional level. It may be difficult to sell these nationally, but they should be promoted as locally produced goods for local consumption brands, cultivated and consumed within the region.”

In the United States, where the world’s highest healthcare costs are not accompanied by world-leading longevity, a former study into world dietary habits concluded that the most nutritionally balanced meals were those of the Japanese around 1975. That “nutritional balance” refers to the ratio of the three major nutrients of

since early times. This tradition may be seen to account for the emergence of the world’s first research into food functionality, Tsushida argues.

Effect of Anthocyanin on Liver Function

Let’s look at some individual functional properties of foods.

A notable example of actual proof of a functional property of food becoming a new added value, leading to local consumption of locally produced goods for that particular agricultural product, is sweet potatoes. The aspect attracting particular attention is the antioxidant anthocyanin contained in large amounts in purple sweet potatoes, black soybeans, and so forth. This began with research that aimed to prove its ameliorative effect on liver

product becoming famous nationwide,” Tsushida says. “In 1995, a new variety called Ayamurasaki which contains large quantities of anthocyanin was also registered. However, since it does not taste good when eaten in its original form, it is being sold as processed goods such as juice, vinegar, or paste, emphasizing its food functionality.”

Continuing on from that, methylated catechin, which is contained in Benifuki tea leaves, is also regarded as promising. This has been proved to be an effective anti-allergenic against hay fever, for example. This attracted the attention of large beverage manufacturers, who since 2006 have been selling Benifuki Sencha and supplements specific to that function.

Further, there is a high level of interest in β -cryptoxanthin, contained in



Vegetable and herb extracts on display at the Health Ingredients Japan Trade Show, November 2007. The annual event is a major showcase for new ingredient ideas in a growing, (est.) 25-billion-dollar domestic market.

proteins, fat and carbohydrates.

In other words, Japan’s “set meal” style of eating a fish or meat dish together with rice and miso soup. This style of eating enjoyed by the Japanese is nutritionally balanced and rather unique in the world. Japanese dietary habits have become Westernized, but this food culture of “one soup three vegetables” has been present in Japan

function and blood fluidity, or its effect on lowering the blood pressure. In the first instance, the ameliorative effect on liver function has been proven. As a result, many varieties of sweet potato are cultivated, mainly throughout Kyushu, and today they are distributed on a national scale.

“Sweet potatoes grown in Kyushu are a rare case of a local agricultural

great amounts in satsumas (Japanese oranges). Attention is being focused on the benefits of this for osteoporosis, to which menopausal women are said to be vulnerable, as well as for phlebosclerosis, and so forth, but so far no real proof has been established.

Meanwhile, Tsushida reveals that those functional foods that have, or are expected to have, bio-regulating

function also have drawbacks.

“Even if the specific function is high, generally speaking, with the exception of satsumas, the foods are not palatable. That is why even if they are acknowledged to have a high bio-regulating function, it is hard for them to become popular foods that will be locally produced and locally consumed. Therefore, as with Ayamurasaki mentioned earlier, they require the additional effort of processing into juice or vinegar, for example, so that only the functionality remains.”

Because of this, improvements in varieties is underway to make them into more palatable food products. These new varieties include, in the case of Ayamurasaki, the new variety Sweet Purple, and in the case of potatoes, the Inca Purple, which like the Ayamurasaki contains large amounts of anthocyanin.

Identifying Functional Foods

Another drawback of functional foods is the fact that currently their benefits cannot be indicated on labels. On the basis of Japan’s Pharmaceutical Affairs Law, except for medical and pharmaceutical products proved to have specific healing efficacy, all are classified as food products. Therefore, Tsushida explains the reality that functional foods themselves are not accepted.

“Functional foods work for some people, and not for others. For medical and pharmaceutical products, this can cause problems. If they are medical and pharmaceutical products, they must have efficacy for all those people who have a specific disease.”

However, ideas concerning food functionality differ according to the country.

For example, in the United States, the government makes announcements such as, “Eating plenty of fruits and vegetables and limiting fat intake helps prevent cancer,” or “A daily intake of 25g of soybean protein may lead to the prevention of heart disease.”

In Japan too, in 1991 the Ministry of Health, Labour and Welfare (MHLW) introduced a new system of

FOSHU (food for specified health uses). This means foods that have added ingredients that function to regulate the physical condition. Further, the safety and efficacy of these have been scientifically proved in experiments on animals and humans. And the health indication (the expression showing the benefit to health) of these foods has been approved by the MHLW. Thus, this is an appellation that is granted only to foods that have cleared these three conditions.

Concerning the bio-regulating function of these foods, the focus has been on the aspects that do not overlap with medical and pharmaceutical products, for example effectiveness in reducing cholesterol or blood pressure counts, or blood glucose or serum triglyceride levels. As a result, large companies have been developing new products and, aided by television advertising, they are now recognized as *tokuho* foods, or FOSHU. Judging from the level of recognition alone, these are now completely outstripping functional foods.

So, what is the distinction between functional foods and FOSHU? “Functional foods is a universal set, comprising the subsets of FOSHU, health foods, and so forth. This is probably the best way of describing it,” says Tsushida.

On the other hand, there are cases of functional foods producing cultural friction.

An example is the soybean which Japanese people have enjoyed eating since early times. This contains large amounts of isoflavones, and is known in Japan for its effectiveness in preventing osteoporosis and for its anti-cancer effect. In France, however, where soybean is not commonly eaten, the food functionality of isoflavones has been promoted in recent years, and the introduction of soybeans led to a debate. The theme was “Is this new type of food, the soybean, safe?” This dispute was imported back into Japan, resulting in considerable confusion.

In this way, functional foods currently have numerous delicate aspects.

Tsushida cites the discrepancies in



The FOSHU logo already appears on a wide range of products in Japan that are proven to have food functionality.

food functionality as a challenge for the future.

“This is accounted for by the differential in capital between private companies and regional producers. Agricultural products from the regions cannot compete with the capital strength that companies possess. It is difficult to sell nationwide too. Not surprisingly, there is a need to protect regional agricultural produce as a resource by fostering locally produced and locally consumed brand products.”

As for the current situation that hinders the promotion of food functionality in association with medical and pharmaceutical products, Tsushida says, “For ingredient labels for fresh produce, I believe the permissible level ought to be extended from the current level and, to an extent, be reexamined with a view to providing information.”

As a leading authority on food functionality research, Tsushida feels strongly that he wants the results of his research to benefit society.

Tsushida concludes, “There is no doubt that food functionality is the result of scientific research. It is also an accumulation of efforts to understand the new roles that food plays. As a symbolical theme to encourage better insight into foods on the part of the general consumer, in the future I expect food functionality to make an even greater contribution to society.”

Ryu Arakawa is a journalist.