

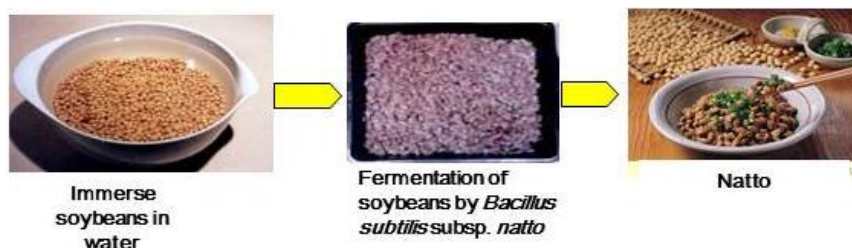
# Chapter 8



*Natto* is the Key to Longevity



Recently, the Western world has come to pay attention to *natto* (納豆), which is a fermented product made from soybeans. *Natto* is one of the most typical fermented foods of Japan. In making *natto* soybeans are immersed in water and then steamed. The steamed soybeans are inoculated with *natto* bacteria and they are fermented at room temperature for approximately 20 hours (Fig. 8.1).



**Fig. 8.1** Process of *Natto* making.

(Pictures provided by Dr. F. Tomita, Sapporo, Japan)

## 8.1 *Natto* bacteria were originally inhabitants of rice straw

*Natto* bacterium is one of bacteria grown in dried grass. In the past, *natto* was made by wrapping steamed soybeans in rice straw, that is, they were fermented by natural habitat *natto* bacteria in rice straw. Even nowadays, in some factories *natto* is made from steamed soybeans covered with rice straw without the inoculation of bacteria (Fig. 8.2).

The *natto* bacterium was once named *Bacillus natto*, but now it is classified into *Bacillus subtilis*. However, there are some scholars who propose *Bacillus subtilis* subsp. *natto* because not all *B. subtilis* species can be eaten. Some of you may say, “Those classifications don’t matter for me”, but people engaged in food industry will be embarrassed if it was classified into the same species with pathogenic bacteria.



**Fig. 8.2** *Natto wrapped over rice straw.*

*Natto* used to be made by naturally inhabitant *natto*-bacteria in rice straw and it was called 'wara-natto'. Left, rice straw is sterilized at 100 °C for 15 min to kill contaminated bacteria such as *Salmonella*, but *natto*-bacteria can survive because of their spores. Right, *natto* is produced by natural fermentation and it takes 24 hours. (Pictures provided by Mr. Y. Fukuda, Fukuda Co. Ltd., Nasu, Tochigi, Japan.)

## 8.2 Why is *Natto* good for the health?

It seems that *natto* was made at the later Muromachi (室町) era (1366~1573). There is a description that in Edo (江戸) era (1603~1868) women after childbirth were advised to eat *natto* because it is easily digested and has a high nutritive value. It was also a very important and valuable food because it has antibacterial effects. In the old days, food poisoning was quite common in Japan and people ate *natto* in order to prevent contagious diseases like cholera, typhoid fever and dysentery. As a matter of fact, dipicolinic acid, found in *natto*, has antibacterial functions against the bacteria like hemolytic colon bacterium, *Escherichia coli* O-157 and *Helicobacter pylori*, the causative agent of stomach ulcers.

During fermentation, the starch and proteins of the soybeans are converted to a mixture that contains amino acids, vitamins and various enzymes. *Natto* contains saponin and isoflavones, which come from soybeans, as well as the fibrinolytic enzyme, vitamin K<sub>2</sub> and dipicolinic acid which are generated by

*natto* bacteria. The fibrinolytic enzyme, designated 'nattokinase' as a popular name, not only breaks up blood clots (thrombi) but also breaks down built-up fibrin that has been associated with heart disease<sup>\*1</sup>.

The amount of vitamin K<sub>2</sub> in soybeans increases to 124 times by the fermentation by *natto* bacteria. Vitamin K<sub>2</sub> promotes absorption of calcium and formation of bones, so *natto* can be said to be useful for preventing osteoporosis.

After the growth of bacteria ceases, *natto* becomes sticky as a result of formation of threads. *Natto* is sometimes disliked because it is very sticky, but the sticky threads are made of poly-L-glutamic acid and they also promote absorption of calcium and strengthens bones. These effects of *natto* might help Japanese older women prevent osteoporosis.

Approximately three quarters of the Japanese people eat *natto* at least once a week and half eat *natto* once every 3 days on average. From these scientific evidences, *natto* has attracted attention all over the world as a food that might promote longevity.

### **8.3 How to select good health foods and supplementary foods without being affected by misleading advertisements**

Can we believe that *natto* has functions of preventive measures of cerebral infarction and myocardial infarction because it has enzymes called nattokinase which can lyse thrombosis? Nattokinase is an enzyme. An enzyme is a protein which is made of chained amino acids. Every kind of protein is degraded into amino acids by the functions of saliva, gastric juice and intestinal enzymes and thus cannot keep the original structure of proteins. The enzyme, which has the

function to degrade protein, is so called 'protease' as I mentioned in Chapter 7. In other words, in this case, the enzyme doesn't have its functions yet. Therefore, we cannot conclude that *natto* has functions of preventive measures of above-mentioned diseases, if we don't make sure that the amount of nattokinase or the amount of plasmin has increased in an appropriate organ. Plasmin is an important enzyme present in blood that degrades many blood plasma proteins, including fibrin clots. Saponin, isoflavone and vitamin K, which aren't protein, are known to be absorbed in the intestines and show each function in the body. Therefore, biochemically speaking, the oral effectiveness of proteins is doubtful.

The same thing can be said as to taking supplementary food which contains collagen. If you ask whether knee-joints become smooth or skin gets clear after you take it, the answer is "No", because it is guessed that collagen is a kind of protein and so it is degraded into the composed amino acids of glycine, proline, hydroxyproline and alanine. Collagen is made up of these unbalanced elements of amino acids, so taking collagen may be effective to the point of supplying these amino acids. The effective elements of them are carried to each organs of the body through blood after they are metabolized and biosynthesized by each internal organ. Therefore, it would be better for you to try those supplementary foods after you ascertain the data that the concentration of collagen increased in blood or at knee-joints. It is known that vitamin C promotes the synthesis of collagen in the body, so I advise you to try inexpensive vitamin C instead of collagen, though these supplementary foods contain vitamin C in general. Please keep in mind that you should not be affected by misleading extravagant advertisements for supplements.

## **8.4 You should not take the same supplementary food too much even if it is good**

I have already mentioned that it is difficult to ascertain the effectiveness of healthy foods and supplementary foods. You may wonder why it is difficult. That is because it is difficult for us to make experiments of double-blind tests by giving those foods to persons as I mentioned in Chapter 1.

However, nowadays in Japan, there are some supplementary foods labeled ‘Specially Appointed Supplementary Food’, effective supplementary foods recognized by the Ministry of Health and Welfare, Japan. To obtain this authorized label for foods, many scientific data including the double blind test are required. Only in that case, you can describe the effectiveness of supplements or functional foods on their label. However, this kind of specially appointed supplementary foods by a government organization is not seen in the USA or EU. Again, I will note the point, “You should not take the same supplementary food too much even if it is good for the health. It causes unbalance of metabolisms in your body.” Taking well-balanced nutrient foods is the only way to keep your health.

## **8.5 *Natto* labeled ‘genetically modified *Natto*’ is sold in Japan now**

Speaking of genetically modified foods, there is *natto* goods in Japan labeled ‘Using Genetically Modified Soybeans’ (Fig. 8.3). They are made of genetically modified soybeans. Dr. Husao Tomita, an Emeritus Professor of Hokkaido University, commercialized this genetically modified *natto*. He developed it because he wanted to help Japanese consumers understand the safety of

genetically modified (GM) foods. Although we, Japanese people, like people of EU, have been already taking GM foods made from imported soybeans or corns, some people are quite sensitive to eating the GM foods. The GM foods, therefore, should be labeled so in Japan at this moment, unlike in the USA. If we continue to avoid genetically engineering technique in spite of this fact, the businesses of agricultural products or other foods will be defeated in overseas markets. Therefore, many universities and national research laboratories have been developing this technique so that we can use this method any time in near future, in case the GM foods are accepted publicly.



**Fig. 8.3** *Natto made from genetically modified soybeans.*

The label designates that “This *natto* is made from GM soybeans”.

When I go abroad, I make it a rule to take GM dry *natto* as a simple relish for beer, which reminds me of my country and home.

## 8.6 Summary

*Natto* is one of the most typical Japanese fermented foods. In making *natto*, soybeans are immersed in water and then steamed. The steamed soybeans are



inoculated with *natto* bacteria and they are fermented at room temperature for one day. *Natto* is easily digested and has a high nutritive value. *Natto* contains saponin and isoflavones, which come from soybeans, as well as a fibrinolytic enzyme, vitamin K<sub>2</sub>, poly-L-glutamic acid and dipicolinic acid which are generated by *natto* bacteria. Approximately three quarters of the Japanese people eat *natto* at least once a week and half of them eat *natto* once every 3 days on average. From many scientific evidences, *natto* has attracted attention all over the world as a food that could promote longevity.

<sup>\*1</sup> Sumi, H., Hamada, H., Nakanishi, K., and Hiratani, H., Enhancement of fibrinolytic activity in plasma by oral administration of nattokinase. *Acta Hematology*, 84:139-14 (1990).

