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Report from "Scientific Lectures on Health and Dietetics 2005"

The Japan Dietetic Association and Vitamin Information Center hold scientific lectures on the dietetic association members of various prefectures as a part of the dietetic education program. These lectures are provided to contribute to maintenance/improvement in the health of Japanese citizens by holding lectures for dietitians who are expected as the human power for instruction on health and nutrition so that they understand the special knowledge and use it for future activities, leading to individual recognition on health as well as correct understanding on nutritional balance and its roles. In this year, lectures were hosted by the Dietetic Associations of Tochigi and Yamanashi Prefectures as follows, and this article introduces an outline of these lectures:

1st lecture
Host: the Japan Dietetic Association, the Dietetic Association of Tochigi Prefecture, Co-host: Vitamin Information Center
Date and time: October 16, 2005 (Wed), Venue: Utsunomiya
Program: "Relationship between Antioxidant Vitamins and Lifestyle-Related Diseases - Based on the Recent Outcomes"
by Professor Osamu Igarashi, Ibaraki Christian University
"Relationship between Catechin and Health"
by Dr. Masashi Ohmori, Dean, Faculty of Domestic Science, Otsuma Women's University
2nd Lecture
Host: the Japan Dietetic Association, the Dietetic Association of Yamanashi Prefecture, Co-host: Vitamin Information Center
Date and time: October 19, 2004 (Sat), Venue: Kofu
Program: "Relationship between Polyunsaturated Fatty Acids and Lifestyle-Related Diseases"
by Ms. Fumiko Hirahara, Adjunct Instructor, the Saiki Nutrition College

Relationship between Antioxidant Vitamins and Lifestyle-Related Diseases - Based on the Recent Outcomes

Professor Osamu Igarashi, College of Life Sciences, Ibaraki Christian University


Prof. Osamu Igarashi

We humans have fought against infectious diseases and lifestyle-related diseases for a long time. At present, the society is aging rapidly and even the infectious diseases that we succeeded in reducing such as tuberculosis can cause serious problems in aging societies. The so-called lifestyle-related diseases including cerebrovascular diseases and cancer occupy a large ratio of recent causes of death. While diet is considered a significant factor for lifestyle-related diseases, another important factor is oxidation. We are surrounded by the sources of active oxygen or free radical that cause oxidation such as tobacco smoke, pollutants and ultraviolet radiation. Though not all diseases occur because of free radicals, it is true that they are related. Several per cent of the oxygen that we require for living change into active oxygen or free radical. If this occurs excessively, the lipids that re most easily oxidized is oxidized first, followed by degeneration of DNA and proteins that lead to diseases such as cancer and arteriosclerosis. What we call the antioxidant enzymes in our bodies and the antioxidants we take in from outside our bodies prevent such oxidation. A typical antioxidant enzyme is SOD (superoxide dismutase). It has been shown that the higher the activity of this SOD is, the longer the expected life of the animal is when comparing the activities of SOD between humans and other animals. Similarly for the blood concentration of vitamin E, which is another typical antioxidant found in our blood, the expected life grows longer as the blood concentration reaches higher. Representatives of antioxidant vitamins taken from outside the body are Beta-carotene (provitamin A), vitamin C, and vitamin E, and these cannot be synthesized in our bodies. Besides these, the carotenoids contained in green and yellow vegetables also deliver antioxidant activities.

Cardiovascular Diseases and Vitamins

Blood pressure and smoking were considered as risk factors of cardiovascular diseases for approximately 20% of the patients, and hypercholesterolemia, obesity, diabetes, etc. were also considered factors in the past. While many studies have been actively implemented on the relationship between vitamin E (alpha-tocopherol) and heart diseases, a negative correlation in which the death rates were lower in nations with high levels of intake was found when a study focused on the relationship between the level of alpha-tocopherol intake and death rate by coronary artery diseases. The results were similar to those of a study on the relationship between red wine intake level and death rate by coronary artery diseases. If you focus on the relationship between food product/nutrition element and death rate by heart diseases in Europe, U.S. and Japan, a strong negative correlation is seen for alpha-tocopherol and red wine. Though there was also a negative correlation with the intake level of vegetable oil, it is considered to be caused by the vitamin E which is contained richly in vegetable oil. Though some recent data report that there is no correlation between vitamin E and heart diseases, I say that the effect of vitamin E can be expected based on the numerous study reports in the past. Vitamin E is also noted for its relativity to the progress of

Alzheimer's disease in addition to heart diseases.

As to heart diseases, recent studies revealed that a substance called homocysteine is another factor besides vitamin E. There are many studies reporting that a higher blood concentration of homocysteine leads to a higher risk for heart diseases. Though we Japanese originally have low blood concentrations of homocysteine, innate homocysteine metabolism deficits have been found in the past. The coenzymes related to the metabolism of this homocysteine are folic acid, vitamin B12, and vitamin B6. Especially the effect of folic acid seems large. Though Japanese people rarely have shortage in vitamin B12 because it can be taken from shellfish, people who had gastric resection in the past may have malabsorption and fall short. The intake level of folic acid varies greatly by the nation, and there are also large individual differences according to the results of a study on female college students in Japan. Caution is required that many people do not satisfy the recommended intake levels. Folic acid must be taken with care especially by women because it is deeply involved with the crisis of birth defects for the fetus.

Gamma-Tocopherol

As to vitamin E (tocopherol), attention is recently gathered on gamma-tocopherol. Since alpha-TPP transports only alpha-tocopherol in the liver 90% of tocopherol in blood is alpha-tocopherol with gamma-tocopherol comprising only about 10%, it was conventionally considered that the activity of only alpha-tocopherol was important. However, it has recently been discovered that gamma-tocopherol side chain is cut short in the body to become gamma-CEHC (carboxyethyl hydroxychromans) and that it has an effect to promote sodium excretion. It is only humans among all land-dwelling animals that may take too much salt, and intake of gamma-tocopherol which is the source of gamma-CEHC with salt excretion effect is considerably important. Further studies are expected.

CoQ10 (Coenzyme Q10)

One of the antioxidant substances that are often on the topic recently is CoQ10. CoQ10 is biosynthesized in our bodies and had been used as a treatment drug for congestive heart failure first. It was recently approved as a food product. The Food Safety Commission, etc. are still discussing on its recommended intake level and upper limit level, and the values are still to be clarified. The effect of CoQ10 is very high in suppressing LDL oxidation (Fig.), and its highest concentration exists in the heart which continues to pump out the blood without rest. The next highest concentration exists in kidneys which require great energy for producing primary urine and concentrating it. Since the deficiency in CoQ10, intake effect, etc. vary greatly among individuals, it is not suggested that all people should actively take supplements. However, CoQ10 in our bodies gradually decrease in concurrence to aging. Thus senior citizens need to take it with care. Though it is also said that it works on various diseases, there is no cut and dry answer to this because there are large individual differences to this as well. For example, those who take cholesterol-lowering statin drugs are apt to fall deficient in CoQ10. This is because the paths of synthesis are nearly identical between CoQ10 and cholesterol, and inhibition of cholesterol synthesis also means inhibition of CoQ10 synthesis as well. In the U.S., they take the measures to administer CoQ10 at the same time to those who use statin drugs, etc. It may be a good idea to use supplements if deficiency may occur due to aging, diseases or administration of certain drugs.

As you can see, antioxidants such as vitamin E, vitamin C and CoQ10 are essential for maintenance or improvement of our health. I suggest that supplements, etc. should be used well considering the dietary life and nutritional conditions of oneself.

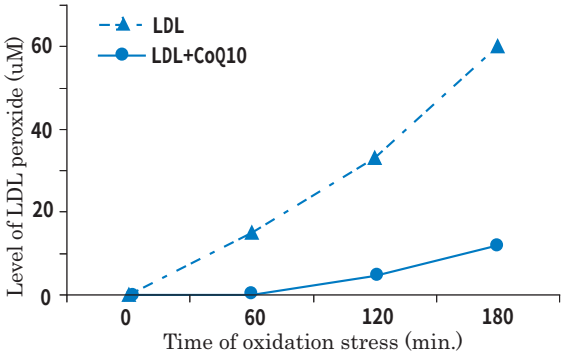

Fig. CoQ10 and LDL oxidation

Relationship between Catechin and Health

Prof. Masashi Ohmori, Dean, Faculty of Domestic Science, Otsuma Women's University


Prof. Masashi Ohmori

I think the word "health" is a very important word. When I looked it up on a dictionary, it said "well-being of body and mind without ailments." You may also see the sentence, "health is not having any diseases." At present, the definition of health by WHO (World Health Organization), "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition" is most globally accepted. To obtain health, I always insist on the importance of daily satisfaction of the 5 pleasures, "eating well, sleeping well, evacuating well, sweating well and feeling well."

Eating well: As suggested by the Ministry of Health, Labor and Welfare, it is to eat 31 different food items a day. Japan is fortunately rich in rice, tea, fish, soybean, etc. Though they may be disregarded in the present days with variety of food products, balanced diet centering on Japanese traditional meals seems to be most important for our health.

Sleeping well: The symptom of not being able to sleep leads to the lack of mental health. It is recommended that about 7 hours of sleep should be used as the target for sleep every night.

Evacuating well: The habit of having daily evacuation is important.

Sweating well: It is important to sweat by jogging, exercising, etc. to suit one's taste or lifestyle.

Feeling well: Laughing with your mouth wide open brings good mental health.

"Eating" among the 5 pleasures above is of course the final and most important factor in maintaining health. While we

used to take 70~80% of energy intake from grains, it has decreased to about 50% these days with increased intake of lipids. It is true that food tastes better when you cook with oil, but the problem of oxidation must be considered when the intake level of oil increases. The current dietary life has fallen into a situation in which health damage by lipid peroxides, etc. cannot be easily prevented unless we consciously take antioxidants.

In Japan, people drank green tea with Japanese traditional meals from the old times. The only nations that produce and drink green tea are Japan, China, Viet Nam and Myanmar. While tea had been treated as a drug for various organs (kidneys, heart, lungs, etc.), the reason it was called a drug was caffeine. Caffeine is the factor for reducing the headache that occurs in case of hangover. Though the history of tea in Japan goes way back, it was only 1991 when the studies on the components of tea including this caffeine were advanced and the international conference for reporting the results was held for the first time in Japan. In this international conference, catechin was in the spotlight instead of caffeine and most of the study reports were on catechin. Catechin transport substance in blood, in vivo functions, etc. are being clarified one by one even today.

Catechin has an antioxidant effect and is expected to be effective on diseases that may be caused by oxidation such as cancer in Japanese people who have higher lipid intake levels. A study on people living in Shizuoka Prefecture (Oguni et al.) has revealed that the rate of cancer genesis and morbidity rate of digestive system diseases are lower in areas with high levels of tea intake. Catechin is divided into different types called EC (epicatechin), EGC (epigallocatechin), ECG (epicatechin gallate) and EGCG (epigallocatechin gallate). EGCG exists in the highest concentration in green tea at 50% or higher. It has been shown in animal experiments that the serum cholesterol concentration decreased dose-dependently when EGCG (epigallocatechin gallate) with relatively high antioxidant activity among these catechins is administered. Furthermore, it has been revealed that simultaneous administration of EGCG and lipids inhibit oil absorption and increased evacuation level into the feces (Fig.).

While the green tea variety called "Yabukita" is most popularly distributed in Japan, it has just been discovered that the variety called "Benifuki" contains methylated catechin which has antiallergic activity. Since the number of allergy patients is increasing in Japan and causing a serious problem, it is desired that further study will be implemented on the variety of tea and its components with such effects. Besides catechin, theanine, an amino acid contained in green tea is also under the spotlight. Studies are being implemented on its effect by aromatherapy and relaxation with theanine.

As you can see, many studies are implemented on tea components. However, the action to drink tea leads to the action of offering hospitality to others, which also works in promoting communication among people.

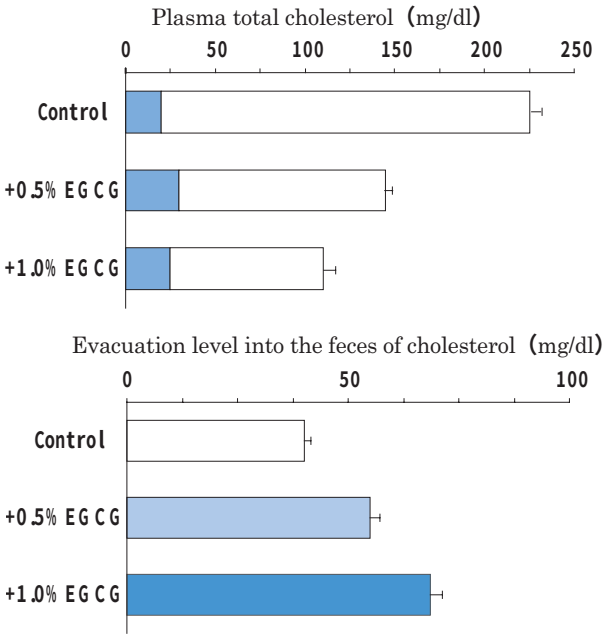

Fig. Effect of suppressing blood plasma cholesterol increase by catechin (EGCG) (in rats)

Relationship between Polyunsaturated Fatty Acids and Lifestyle-Related Diseases

Dr. Fumiko Hirahara, Adjunct Instructor, the Saiki Nutrition College

Dr. Fumiko Hirahara

At present, 60% or more of all deaths of Japanese people are caused by lifestyle-related diseases, and most of them are ascribed to dietary life. Dietary life is also considered to lie in the background for Japan to have become a nation of longevity, and it is a known fact that the Japanese traditional meals are globally placed in the spotlight and are being studied. Japan has had leading activities in terms of nutrition in the world, and it was Dr. Saiki of Japan who created the position of dietitian and trained them. Japan is also the first nation to develop functional food products. As you can see, Japan has regarded the field of nutrition with importance and continued national nutrition surveys that are unprecedented in any other parts of the world for a long period to use the data in grasping the nutritional status of the citizens, establishment of food intake standards, health control, etc. While traditional Japanese meals were reconsidered as the number of lifestyle-related diseases increased and the society aged, it is also noted that the effect of lipid intake is also large when focusing the effect by the nutrient.

The current studies on lipids have advanced on to breakdown to fatty acids, and there are many studies on individual fatty acids including arachidonic acid, linoleic acid, EPA and DHA, revealing various functions and effects on our health. One incidence for fatty acids to be in the spotlight was the NI-HON-SAN Study. This was a study on the morbidity rates of heart diseases for Japanese people living in Japan and Japanese people living in Honolulu and San Francisco which revealed difference in the morbidity rate although these groups had the same racial genes. As a result of studying the dietary life, it was considered that the difference in lipid intake with lower intake of saturated fatty acids in the group living in Japan than the groups living in other nations led to the difference in morbidity rate.

Furthermore, a study that compared the dietary lives of the Japanese people in the 1960s, the Japanese people in the 1980s and the American people in 1985 showed that the level of saturated fatty acid intake was higher in the U.S. than in Japan, and higher in the 1980s than in the 1960s in Japan. Focusing on the ratio between n-6 type unsaturated fatty acids and n-3 type unsaturated fatty acids, the value has been gradually increasing from approximately 3 in the 1960s. The n-6/n-3 ratio is also high in the U.S., and it is considered a factor for increased number of heart diseases. To lower the morbidity rate of heart diseases, the Japanese meals of the 1970s seem to be ideal. Furthermore, it was found that the types of component fatty acids also affect the number of deaths in addition to the level of lipids in a study which compared the Danish people and Inuit people in Greenland, because the number of deaths by myocardial infarction was extremely small in Inuit people who had high intake of total lipids but was high in concentration of EPA when blood concentrations of fatty acids were focused. In Nures's Health Study, the correlation between the level of fish intake and rate of death by myocardial infarction was discovered. Similar results were reported by the Harvard's Physicians' Health Study and the GISSI Study, and studies of this type are still being implemented even today. Beginning with the study on the relationship between fish intake and fatty acid metabolism, the effects of fatty acids contained in fish, especially EPA and DHA on lipid metabolism have been revealed in recent years. We now know that DHA intake lowers the blood cholesterol concentration and EPA intake lowers the blood neutral fat level. By clarifying the functions of each fatty acid, it is possible to utilize the fatty acids to be administered depending on the type of disorder in treatments on hyperlipemia patients by administering EPA on patients who are apt to form thrombus for instance.

More recently, the antiallergic effects of the n-3 type unsaturated fatty acids are under the spotlight. Our normal meals have relatively high intake levels of linoleic acid type (n-6 type) fatty acids with a high n-6/n-3 ratio, and it is considered that this is because our fish intake is insufficient. Increase in linoleic acid intake is suspected as one of the causes for increased number of allergy patients, and there are reports suggesting that intake of n-3 type unsaturated fatty acids by atopic disease patients reduces the inflammation. Considering such results, instruction on nutrition may be provided for allergic disease patients and hyperlipemia patients in order to reduce the intake level of n-6 type unsaturated fatty acids and bring the n-6/n-3 ratio as close to 1 as possible. However, it is important for healthy people to keep the n-6/n-3 ratio balance to 4:1 instead of reducing the intake levels of n-6 type unsaturated fatty acids.

Another hot topic is the existence of a relationship between DHA and brain functions. There are more and more questions asking "do you become smarter if you take DHA?" Though it is not completely false, it is true that the effect is so visibly significant by only taken it in a large volume. However, DHA does exist in the brain and taking it is important to activate its functions. Comparing the compositions of intermediate to polyunsaturated fatty acids in breast milk in various nations, the n-6/n-3 ratio is found to be lower in Japan than in the U.S. or Germany. It is possible that DHA intake may actually improve the brain functions, and appropriate lipid intake by the mother is desired in order to avoid lowering in the intake level of n-3 type unsaturated fatty acids during the infant stages.

Today we live in information society and consumers are able to obtain various different data from TV, Internet, and so on. However, not all data are correct and I hope that you should have correct knowledge and work toward proper instruction and education of the consumers as specialists.

Table 1 Number of deaths by the disease in Danish people and Inuits (Greenland)

Disease	Danish	Inuit
Acute myocardial infarction	40	3
Cerebral hemorrhage	15	25
Multiple sclerosis	2	0
Psoriasis	40	2
Thyrotoxicosis	7	0
Bronchial asthma	25	1
Diabetes	9	1
Cancer	53	46
Gastric ulcer	29	19
Epilepsia	8	16
Nervous diseases	8	10

Table 2 Physiological activities of DHA and EPA

Physiological activity	DHA	EPA
Improvement in blood lipid levels		
(Cholesterol)	○	△
(Neutral fat)	△	○
Suppression of blood pressure	○	○
Antithrombogenic effect	○	◎
Antitumor effect	○	○
Antidiabetic effect	○	○
Anti-inflammatory effect	○	○
Antiallergic effect	○	○
Improvement of memory/learning functions	◎	-
Improvement of retinal reflection	◎	-
Emotional stability	◎	-

Table 3 Highly-unsaturated fatty acid composition in breast milk (%)

Reported by	Yonekubo (1980)	Itoda (1989)	Gibson (1981)	Bitman (1983)	Koletzko (1988)
Nation	Japan	Japan	Australia	U.S.A.	Germany
Lactation period	21-60 days	31-61 days	40-45 days	37-40 wks	3-4 months
Number of samples	735	562	61	6	15
n-6PUFA	15.5	15.2	12.2	16.4	12.3
Linoleic acid	14.7	14	10.8	15.6	10.8
Arachidonic acid	0.28	0.4	0.4	0.4	0.36
n-3PUFA	2.49	3.26	1.28	1.37	1.38
Alpha-linolenic acid	1.59	1.53	0.59	1.03	0.81
EPA	0.12	0.24	0.16	0	0.04
DHA	0.63	1	0.32	0.23	0.22
n-6/n-3	6.22	4.26	9.49	11.96	9.23