

Collaboration between diet and vitamins against life-style related diseases

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1. Situation of vitamin intake seen from the National Nutrition Survey and the menus of our hospital

The situation of vitamin intake according to the National Nutrition Survey for 2001 shows 75 - 85% sufficiency rates for vitamins B1, B6, E and niacin in men and nearly sufficient in women compared to the 5th nutrient requirements. However there is a sort of trap here. Because it is the generation in which it is said that lipid ratio of 25% or smaller and energy intake that will not cause obesity are necessary for maintaining health but these are actually taken too much. That is, considering that vitamin E is taken from oils and fats, rate of sufficiency cannot be taken as it is.

As a result of examining the normal meals (approximately 2,000kcal) and diabetes meals of 1,600kcal in our hospital, vitamins E and B6 were not sufficient in 2,000kcal meals, showing similarity to National Nutrition Survey. In the 1,600kcal meals, vitamin B1 was also insufficient (Figure 1). On the other hand, vitamins A (retinol), D, and B12 were sufficient in either meal.

When looking at the intake level and rate against the required nutrient level of vitamin E with extremely low sufficiency for each food group, it was taken as 2.6mg (26%) from oils and fats, 2.0g (20%) from dark green and dark yellow vegetables and 1.6mg (16%) from fishery products (Figure 2). For the 1,600kcal meals which are the energy-restricted meals for diabetes or obesity patients, vitamin E reaches only 5.4mg (54%) since fishery products and meat with much oils and fats to be added are reduced. Considering this, it is extremely insufficient in people with low energy intake or on diet, people who do not eat fishery products much, and people who often eat out. In other words, vitamin E cannot be taken sufficiently by people who takes little oils and fats unless they select the food products to eat with considerable knowledge.

Next, which food products are used to take vitamin B6 in the menu of 2,000kcal

meals was examined, and it turned out that it was taken from a very limited group of food products including 0.72mg (44%) from vegetables and fruits and 0.27mg (38%) from fishery products (Figure 3). Examining the intake levels in National Nutrition Survey by age, vitamin B6 is not sufficient in ages 15 - 49 for both men and women. It is thus surmised that vegetables and fishery products are started to be taken only after reaching the fifties.

2. Current state of supplement intake and dietary habits

According to the National Nutrition Survey, 65.3% of men and 67.4% of women among those who take vitamins and minerals from sources other than the general food products answered "nearly everyday," and those who answered "nearly everyday" were largest in number in any age group for both men and women. The problem is that those with undernourishment have low vegetable intake levels and many use of supplements (Figure 4). Furthermore, when looking at the types of supplements by the age group, ages 15 - 49 in both men and women had "vitamin C" supplements in the largest numbers. It can be interpreted that they recognize vegetable insufficiency or that they think it will work as alternative to vegetables. On the other hand, it is reported that largest portion of men over 50 years old take "vitamin B1" and that of women at ages 50 - 69 take "vitamin E."

Looking at the 2,000kcal meals of our hospital, not only vitamin C but also approximately 40% of vitamin B6, 20% of vitamin E, 25% of calcium as well as folic acid, iron, dietary fiber, etc. are taken from the vegetables. That is, those with vegetable insufficiency also lack in these other nutrients. Naturally, those who "do not take enough nutrients from food" or those with undernourishment should improve their diet, and it is needless to say that education on this matter is necessary.

Introduction

"Food with nutrient function claims," which complements vitamins as food other than the general food products, has been standardized in concurrence to system establishment. The purpose of this food is to supply/complement nutrients (minerals, vitamins, etc.) necessary for healthy growth, development, and maintenance of health, and the food is to supply/complement the nutrients when it is difficult to have normal diet due to aging, disturbed dietary habits, etc. and thus difficult to take enough nutrients required for one day. The 12 vitamins that are required to be indicated are A, D, E, B1, B2, B6, B12, C, niacin, folic acid, biotin, and pantothenic acid. However, the problem is how to find what types of people tend to have vitamin insufficiency and recommend if proactive supplement is necessary depending on the intake of general food products.

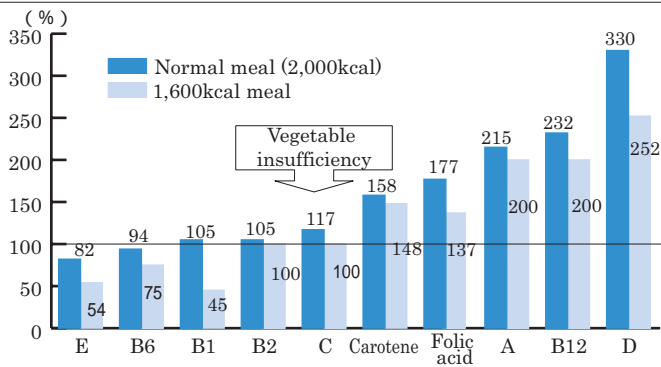


Figure 1 Vitamin sufficiency rates in normal and 1,600kcal meals (men of ages 50 - 60)

However, it is also necessary that vitamin supplement that suits the individual dietary habit shall be made possible for those who cannot improve their dietary habits completely.

3. Supplement vitamins depending on the individual situation and dietary habit

1) People on diet, with diabetes and/or hyperlipemia.

Those who are on diet tend to reduce grains, oils and fats, and meals in order to reduce the energy intake, and they may cause vitamin B1 insufficiency. However, diabetes patients who needs to limit sugar intake and hyperlipemia patients who need to reduce meat intake fall in the dilemma in which more nutrient insufficiency is case as they use better dietary therapy. It is necessary that vitamin B1 insufficiency be assumed and checked if symptoms of fatigableness, low concentration, irritation, etc. are seen. That is, "reducing grains" also means "reducing protein, dietary fiber, zinc and magnesium." In addition, reduction of oils and fats will cause reduction in vitamin E, and reduction in meat will make it difficult to take sufficient amounts of vitamins B1, B2, B6, etc. Therefore, it is desired that those who need to lose weight or those with tendency for diabetes or hyperlipemia shall supplement vitamins E and C and antioxidant substances such as Beta-carotene besides general food products.

Furthermore, please note that the vitamin B6 has been reported to cause sensory nerve disorders by excessive intake, and the tolerable upper limit intake level is stipulated as 100mg in Japan.

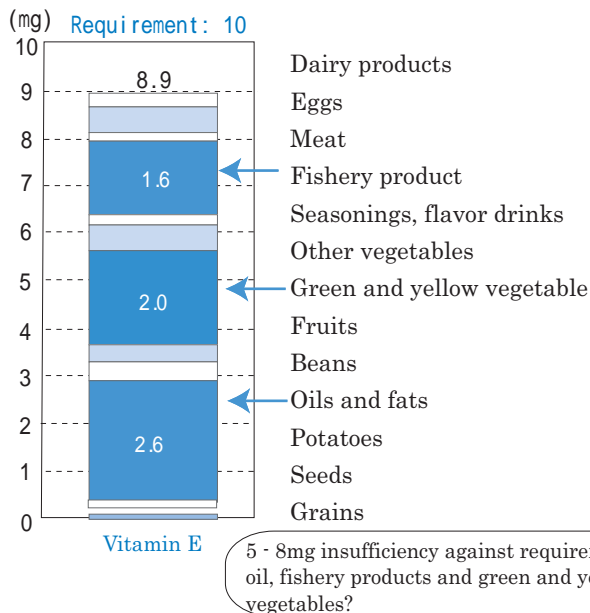


Figure 2 Vitamin E intake by the general food group and dietary habits

2) People with vegetable/seaweed insufficiency and people who often eat out or have large stress

Those who often eat out tend to have vegetable insufficiency. Such people cannot take sufficient vitamins C, B6, and E, Beta-carotene, calcium and potassium (Figure 5). We recommend that those who cannot improve such dietary habits should take food with nutrient function claims containing these or green soup, chlorella, food containing browse from wheat, barley etc., wild rice, vegetable oil containing vitamin E, etc. In addition, those who are under large stress will have vitamin C, calcium and magnesium discharge in urine and should take vegetables and dairy products or take supplements if it is difficult to take such food products.

3) People with habits to drink heavily and cannot restrict

People with habits to drink heavily tend not to eat much food or much vegetables or seaweeds even if they eat, leading to skipping of breakfast and eating out for lunch in many cases. Then naturally many types of vitamins will become insufficient. They may cause insufficiency in various vitamins not only vitamin B6, C, E, K and folic acid from vegetable but also B1 from grains. Moreover, heavy drinkers are said to deteriorate in vitamin D, K and folic acid absorption from intestines and may lead to insufficiency. Therefore, they shall first try to take dark green and dark yellow vegetables. However, if it is difficult, they shall be complemented with chlorella, herbs, or seaweed supplements.

In addition, it is known that daily folic acid intake of 5,000 μ g or larger may hide the symptoms of vitamin B12 insufficiency and lead to damaged nerves. Thus it shall be used in combination with vitamin B12 supplement. And the tolerable upper limit of 1,000 μ g shall be observed.

4) People who cannot stop smoking

Those with smoking habits are known to have large vitamin C consumption and reduce vitamin B12 stored in tissues, and it has been proved that smoking significantly deteriorate the serum concentrations of folic acid and zinc. Though what shall be prioritized is to stop smoking, those who cannot do so shall take vegetables and fruits. Those who cannot even take vegetables and fruits should supplement with food with nutrient function claims containing vitamin C and folic acid, food containing browse from wheat, barley etc. with large vitamin C content or chlorella.

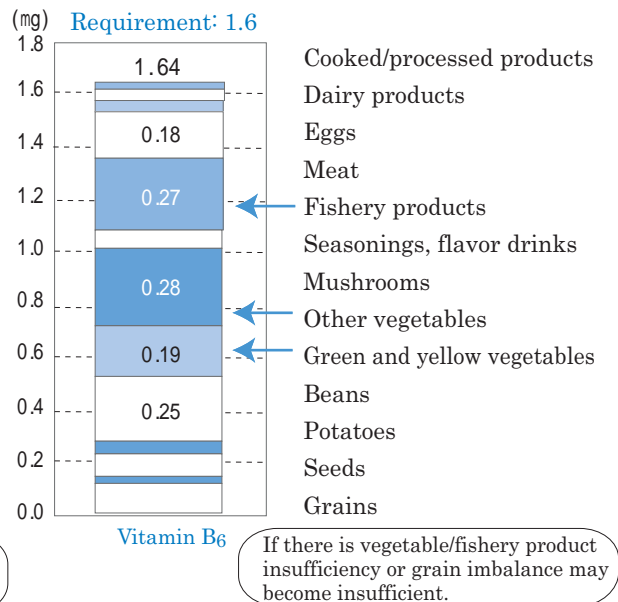


Figure 3 Vitamin B6 intake by the general food group and dietary habit

5) Vitamins recommended for people in middle ages and over

Active oxygen (free radical) accelerates aging. It is desired that people with rather high blood sugar levels or serum lipid levels should proactively supplement vitamin E, C, Beta-carotene, coenzyme Q10, isoflavone, polyphenol, lycopene, chitosan, catechin, sesame seed lignan (sesaminol), etc. which are antioxidant substances that suppress active oxygen. Among these, coenzyme Q10 has been proved to reduce the oxidized vitamin E and return stable vitamin E, and it is said that its antioxidant effect lasts longer than the single use of vitamin C or E.

4. Points in complementing vitamins

The points in taking and selecting vitamins are the following. (1) Look at the ingredient labeling and raw materials. (2) Know that there are nutrients and food products that may have toxicity by excessive intake. (3) Check if they have interaction with kidney disease, allergy, pregnancy, and drugs. (4) Select by assuming the

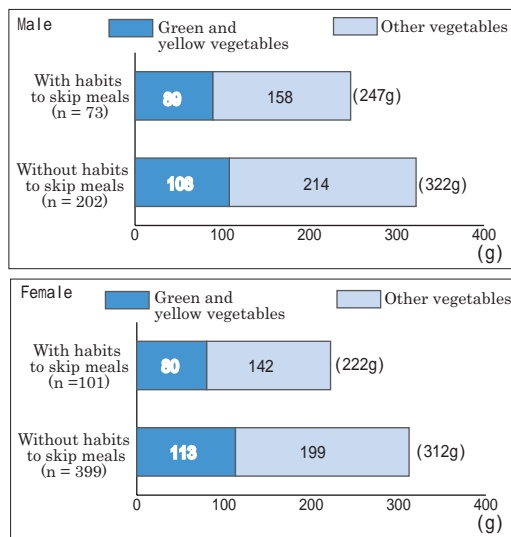


Figure 4 Vegetable intake levels by the habit to skip meals for those who take vitamins and minerals for the purpose of "supplementing insufficient nutrients"

nutrient excess or insufficiency by individual dietary habits. (5) Observe the specified intake method and volume. (6) Observe with small levels. (7) Divide the volume and take uniformly at 2 - 3 times per day instead of taking at once. (8) Check if they are taken redundantly. If you have kidney disease, supplements with large protein, potassium or phosphate contents shall be avoided, and if you are pregnant, supplements should not be taken unless a specialist is consulted.

5. Conclusion

Our national dietary habits have changed to skipped meals, habits to eat out, use of cooked products or fast food, and transition from traditional Japanese food to European and American food though it also depends on the generation and sex. It is considered that in people with such dietary habits, they caused excess or insufficiency in various nutrients and became the factors of various life style related diseases such as hyperlipemia and diabetes. However, there are people who cannot improve the habits even though they recognize the adverse effects. Those who try to use vitamin supplements as alternative food products may be the ones who are rather more interested in health and nutrients. If so, leading them to improve the dietary habits gradually in concurrence to use of supplement may be more advantageous.

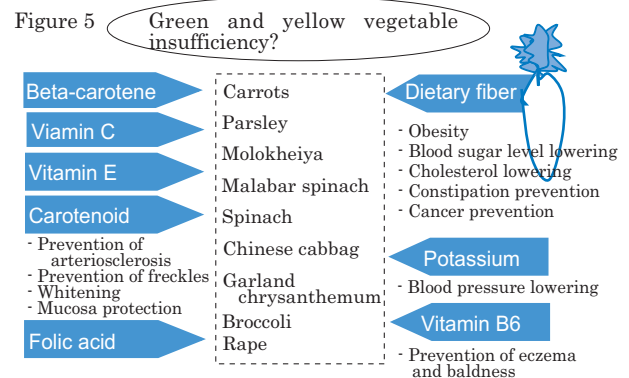


Figure 5

Life Style Related Diseases: Current State of Obesity and Diabetes in Japan

Material: Ministry of Health, Labour and Welfare (2001 National Nutrition Survey, 2002 Diabetes Status Survey)

Diabetes

Preliminary report from 2002 Diabetes Status Survey

Number of people surveyed: 5,792 (2,369 men and 3,423 women)

Time of survey: November 2002

Implemented simultaneously with National Nutrition Survey and Physical Conditions Survey

Estimated number of people suspected to have diabetes

	2002	1997
People strongly suspected to have diabetes	Approx.7.4 mio	Approx.6.9 mio
People who cannot be denied of possibility to have diabetes	Approx.8.8 mio	Approx. 6.8 mio
Total	Approx.16.2 mio	Approx. 13.7 mio

Obesity

Rates of obese people (with BMI25.0 or higher*)

	Male		Female	
	%	n(no. of people)	%	n(no. of people)
Ages 20-29	18.1	414	7.4	552
30-39	29.3	559	14.3	753
40-49	31.8	620	17.1	759
50-59	31.9	744	25.1	916
60-69	31.2	693	30.5	832
70 or older	21.0	585	28.8	817
Total	28.0	3,615	21.6	4,629

*Obesity judgment criterion by BMI (Japan Society for the Study of Obesity)
 $BMI = \text{weight (kg)} \div (\text{height m})^2$
 Less than 18.5: Low weight (thin)
 18.5 or higher and less than 25.0: Normal
 25.0 or higher: Obese

Age-related Macular Degeneration (AMD) and Antioxidant Substances

From Hannah Bartlett, et al., Ophthal. Physiol. Opt. 2003 23: 383-399

Age-related macular degeneration (AMD) is one of the causes for sight loss in advanced nations. Since there is no effective cure and oxidation is considered as one of the factors, there are growing interests in preventive effects of antioxidant nutrient intake. This article reviews the 7 random assignment comparison tests implemented on the effect of antioxidant substance intake in AMD. Among these, effect of antioxidant substance intake against AMD was observed in 3 zinc studies by AREDS, LAST, and Newsome, et al. (Table 1). The following provides an outline of the LAST study in which effect of antioxidant substances on AMD was observed, as well as discussion on the relationship between various antioxidant substances and AMD that is surmised from the study results in the past.

LAST (The Lutein Antioxidant Supplementation Trial)

Subject: 90 atrophic AMD patients with average age of 74.7 ± 7.1

Method: Patients were assigned to 3 groups (age, time of AMD crisis, smoking habit, history of cardiovascular diseases, iris color lens, nutritional status, etc. were matched).

- (1) Lutein : 10mg
- (2) Lutein / antioxidant : 10mg
- (3) Placebo

Outcomes: Lens opacification, glare recovery, low luminance/low contrast visual acuity, contrast sensitivity, etc.

Result: In lutein intake group and lutein + antioxidant substance intake group, results of glare test, contrast sensitivity, etc. were improved significantly.

<Vitamin C>

Vitamin C is a water-soluble antioxidant substance, and it delivers effects against hydroxyl-radicals, super oxides, singlet oxygen, etc. In a study by the EDCCS group, the risk for AMD increases when the vitamin C concentration in blood plasma is low. However, it has been reported that no preventive effect was observed when vitamin C concentration in blood plasma is high (The Eye Disease Case Control Study Group, Arch. Ophthalmol. 111, 104 - 109, 2003). As the preventive effects against oxidative damage of tissues by free radicals, the effect to delay the advance of disease is also expected to be included.

<Vitamin E>

There are 4 types of vitamin E called α -, β -, γ - and δ -tocopherol. The one most activeness in human eye retina and blood plasma is α -tocopherol, and it delivers the highest antioxidant performance. The preventive effect of vitamin E against AMD is indicated in epidemiological study results related to intake by AMD patients or vitamin concentrations in blood. A large level of vitamin E is found inside the eye retina, and it prevents excessive oxidation of lipids. It also has the effect to remove singlet oxygen. Though vitamin E concentration decreases following aging, eye retina concentration can be increased by taken the vitamin in large amount. In addition, it has been observed that increase in vitamin E concentration in blood plasma reduces the AMD risk.

<Lutein/zeaxanthin>

Lutein and zeaxanthin are assumed to protect the eye retina by the two methods of absorption of blue light and prevention of oxidation.

Absorption of blue light: Lutein and zeaxanthin shields short-wavelengths and prevents oxidation by blue light to function as an effective blue light filter. The observed action spectrum for light shielding is 400 and 450nm at maximum, and these coincides with the absorption spectra for macula lutea pigments.

Prevention of oxidation: Carotenoid has elimination function against singlet oxygen or hydroxy-radicals that are generated by excessive oxidation of lipids, and prevents oxidation of tissues by light or metabolism.

Table 1. Randomised controlled trials included in the review

Study	Antioxidant (mg)	Follow-up	Result
1 AREDS	Vitamin C 500, Vitamin E 273 Beta-carotene 15, Zinc 80, Cu 2	Average 6.3y	Positive results in combination
2 ATBC	Vitamin E 50, Beta-carotene 20	5-8y	No effect
3 VECAT	Vitamin E 335	4y	No effect
4 Visaline [®]	Vitamin C 200, Vitamin E 40 Beta-carotene 40, Buphenine 1.5	6 months	No effect
5 Zinc in macular degeneration	Zinc 200	1-2y	Positive effect
6 Zinc and the second eye in AMD	Zinc 200	2y	No effect
7 LAST	Lutein 10 Lutein/Antioxidant 10	1y	Positive effect

- 1) The AREDS Research Group (2001), Arch. Ophthalmol. 119, 1417-1436
- 2) Teikari et al. (1998), Acta Ophthalmol. Scand. 76, 224-229
- 3) Taylor et al. (2002), Br. Med. J. 325, 11
- 4) Kaiser et al (1995), Ophthalmologica 209, 302-305
- 5) Newsome et al. (1988), Arch. Ophthalmol. 106, 192-198
- 6) Stur E (1996), Invest. Ophthalmol. Vis. Sci. 37, 1225-1235
- 7) Richer et al. (2002), Invest. Ophthalmol. Vis. Sci. 43