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Vitamin D is good for the intestinal care! It supports immunity and intestinal bacteria

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Vitamin D is an essential nutrient for bone health!

Vitamin D is a component that has attracted people's attention in recent years with its benefits for intestinal health and immune system. Vitamin D is one of the fat-soluble vitamins and known as a nutrient that promotes calcium absorption in the small intestine to help the formation of bones. We can take vitamin D from foods but it can also be synthesized in the body. When we are exposed to sunlight and take a sufficient amount of ultraviolet rays, vitamin D can be produced in our bodies. Therefore, vitamin D is also called "Sunshine vitamin".

Recently, cases where infants develop "rickets" due to a vitamin D deficiency are occurring more often. Rickets among children are also known as "osteomalacia" in the case of adults. The symptoms of rickets among children occur when the calcium in their bones is not produced properly during their growing years; which in turn, makes their bones soft and easily bent, thus making them susceptible to be easily broken. In Japan, the number of children with poor nutrition is reduced which also decreases the chance to develop rickets.

However, the number of children who develop rickets from an unbalanced diet and the lack of exposure to ultraviolet light has been increasing in Japan. There is another report where more than 80% of elderly people in Japan are deficient in vitamin D. In recent years, young women have been avoiding exposure to sunlight, as they want to prevent the aggravation of symptoms of dermatitis such as atopy and the influence of ultraviolet rays on skin cancer and cataracts. On top of that, bad eating habits encourages vitamin D deficiency in the body. This is becoming a serious problem.

Vitamin D was discovered as a nutrient to prevent rickets. The key characteristic of rickets is the non-occurrence of bone mineralization due to the lack of calcium and phosphorus which will make bones soft. Vitamin D is hydroxylated in the liver and kidney and then converted into active vitamin D. Active vitamin D helps the absorption of calcium and phosphorus in the small intestine and promotes reabsorption of minerals in the kidneys in order to keep the concentration of calcium and phosphorus at a constant level in the blood. Vitamin D promotes the deposition of calcium and phosphorus in bones and helps bone formation and growth with the above mentioned ways.

Vitamin D is indispensable for the immunity and infection control in intestines!

As mentioned in the previous paragraph, vitamin D is an indispensable nutrient for bone health. Furthermore, it has a great influence not only on bones but also on risks of developing other diseases. According to a number of research reports, the deficiency of vitamin D is associated with increased risks of hyperthyroidism, autoimmune diseases (type I diabetes, multiple sclerosis, rheumatoid arthritis, inflammatory bowel disease (ulcerative colitis, Crohn's disease, etc.)), cancer, asthma and obesity. The reason of these increased risks is that vitamin D stimulates “vitamin D receptors” which exist in large numbers in the small intestine in order to activate immune cells including lymphocytes. Hypertension and myocardial infarction which are known as lifestyle diseases are also affected by vitamin D deficiency. Furthermore, it is suggested that there is a relationship between infertility and vitamin D deficiency. Vitamin D plays an essential role in maintaining the proper balance of hormones.

In the latest literature, the action of vitamin D on the intestinal conditions has been suggested. Vitamin D activates intestinal immunity by stimulating the vitamin D receptors, which are present in numerous small intestines, but at the same time encourages the production of antimicrobial peptides (the form in which several amino acids bound to each other) to be secreted from intestinal cells in order to prevent infections. Vitamin D also mediates the communications between intestinal bacteria, and helps to maintain intestinal microbiota in appropriate balance.

Studies using mice showed that the barrier function of intestines of mice was destroyed when they were given feed without vitamin D or their vitamin D receptors in the small intestine were destroyed. When the barrier function of intestines was destroyed, there was a possibility that the toxin called endotoxin, which was produced by bad bacteria, enters to the intestines and eventually flows into the blood which in turn may induce inflammation

throughout the body. In fact, the intestinal microbiota of mice which ingested vitamin D was well maintained and the concentration of vitamin D in their blood was stabilized. On the other hand, the number of good bacteria decreased in the intestine of mice with vitamin D deficiency and the inflammatory marker in their blood increased.

Take vitamin D from meals and sunlight to make a healthy body!

According to the *Dietary Reference Intakes for Japanese* (2015) released by the Ministry of Health, Labor and Welfare in Japan, the standard of ingesting vitamin D from a meal is 5.5 microgram per day for adult men and women aged 18 years and over. There are other developed countries where they set it as 10 to 25 micrograms. The required intake volume varies depending on the country. This is probably because the necessary intake volume of vitamin D may change depending on the time of exposure to the sun. For example, the duration of sunshine in countries located at high latitudes inevitably become short which increases the risks of developing diseases due to vitamin D deficiency

There are several different kinds of vitamin Ds. Vitamin D2 is found in many vegetable foods such as dried shiitake mushrooms, Jew's-ear and dried radish. Vitamin D3 is contained in various forms of meat such as salmon, tuna, saury and sardine. Vitamin D3 is also synthesized in the body by exposing the precursor called provitamin D3 existing in the skin to ultraviolet rays. For example, vitamin D3 is synthesized in the body by sunbathing for about 15 minutes in the summer and about 30 minutes in the winter. It is better to avoid getting excessive exposure to ultraviolet rays, but moderate sunlight is very important for maintaining general health and intestinal environment.

Recently, the Center for Global Environmental Research at the National Institute for Environmental Studies set ultraviolet ray monitoring stations in various parts of Japan, and observed the average of 30 minutes of ultraviolet ray that produces vitamin D as well as the amount of vitamin D that is synthesized in the body in 10 minutes.

http://db.cger.nies.go.jp/dataset/uv_vitaminD/en/

The market for supplements related to vitamin Ds is very vast outside Japan. The main reason seems to be that people cannot cover the deficiency of vitamin D unless by taking vitamin D supplements, an exception would be the people who take a well-rounded optimal diet. However, since vitamin D is fat-soluble, it is difficult to be excreted in urine and tends to be accumulated in adipose tissues and the liver in the body. So, we should be

careful when taking vitamin D in order to not exceed the recommended amount. An excessive ingestion of vitamin D may cause poor physical conditions such as nausea, anorexia, weight loss, etc. When we take vitamin D supplements, we should follow the recommended daily intake amount properly and try to cover vitamin D from meals and natural sunlight as much as possible.