HEALTH AND NUTRITION NEWS

No. 16

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Prefatory Note

Ten years' partnership between the NIHN and "*Hana no kai*"

Satoko Takeuji (maiden name: Tanaka)
Representative, *Hana no kai*
Bronze medalist in 100m backstroke at ROME 1960 Olympic Games

In January 1995, a swimming project "Research on maintenance/promotion of health and physical strength in the working middle-aged and older women" was launched by the National Institute of Health and Nutrition (NIHN) in collaboration with "*Hana no kai* (=a florescent group)". On the occasion of 10th anniversary, there was a seminar at the NIHN. Here, I would like to introduce the outcome of ten years' partnership between the NIHN and *Hana no kai*, which was presented in the above seminar.

First, Dr. Heizo Tanaka (then Director-General) addressed that "I am very happy that this project has been producing steadily good results, based on scientific evidences. We would like to continue our efforts to disseminate this valuable know-how across the country, by which we expect to support the middle-aged and older persons who continue regular exercise".

Next, Dr. Keiji Tanaka (then Director, Health Service Bureau, the Ministry of Health, Labour and Welfare) stated that "I am pleased that this project makes a great achievement. The Ministry of Health, Labour and Welfare launched "Health Japan 21 (2000-2010)". When we make suggestions on various exercises as a part of the above ten years plan, we would like to utilize the results of this project as a guideline of exercise"

Prof. Mitsuru Higuchi (Faculty of Sport Sciences, Waseda University) explained that "I have been involved in this research since the foundation of *Hana no kai*, and we can see that there are various achievements by them. First, unlike walking and jogging, for the persons who can not swim, there is no physical change during the first year after s/he start swimming. And, physical endurance would increase from the second year, followed by further increase up to the forth year. Consequently, one's physical strength would also increase. The above finding shows that it is important to create the first cue to start swimming, because everybody could learn to swim well if one receives the proper guidance, and improve his/her physical strength. In addition, it is also explored that swimming is effective to prevent osteoporosis, which is a big concern among the middle-aged and older women nowadays.

So far, it has been regarded that the sports that accompany jumping and bouncing (e.g. tennis, badminton) should be most effective to prevent osteoporosis, which prevailed as a common knowledge in the field of the Sport Medicine. However, when we investigated the association between bone density and swimming, we found that bone density of femur, at the neck of the legs, was significantly higher among those with swimming history for two years, compared to that of those who never have exercise habit. This was also a quite surprising finding, defying our common understanding. In this way, I can say that the data of the measurements at *Hana no Kai* could give us a great asset".

Lastly, Dr. Izumi Tabata (Program Director for Health Promotion and Exercise, NIHN) said, recalling the ten years' activities, "The NIHN moved in the current place in September 1992. New building was equipped with a long-awaited heated swimming pool and an exercise floor, so as to facilitate the studies to examine the impact of exercise in a certain group. While we repeated discussions to establish our research objectives, Prof. Mitsumasa Miyashita (University of Tokyo at that time) informed us that the members of the 7th "IBM woman's seminar" launched a swimming project and were looking for an available pool. After the discussion with the members, our research objectives agreed each other, and that a joint project was established with *Hana no kai*".

We, *Hana no kai*, are very grateful to the NIHN for being the strong partner with providing us the place for our activities, and that we would like to cooperate with undertaking our joint researches.

** The original Japanese version was translated by Project for International Research and Development,*

Current Research Projects

Project for the Dietary Reference Intakes

Satoshi Sasaki
Project for Dietary Reference Intakes
Nutritional Epidemiology Program

Do you know what “Dietary Reference Intakes (DRIs)” is? DRIs determines the amounts of energy (calorie) and 34 nutrients that Japanese people should take, which was established by the Ministry of Health, Labour and Welfare. DRIs is used as a standard for the food services at school and hospital, as basic information for dietary guidance at health centers and hospitals, and as a basis for nutritional labeling of foods on market sale. In this way, DRIs is widely used for our healthy lives. The latest version “DRIs for Japanese, 2005” was published in April last year. DRIs used to be called “recommended dietary allowance,” but it was renamed in line with the development of nutritional science, transition of disease structure, and trends in other countries.

DRIs is formulated, with the careful consideration of current nutritional and health problems in Japan, by reviewing the research outcomes of the scientist in Japan as well as in other countries. For which, we have to keep an eye on nutritional researches undertaken all over the world, collect all the information, examine them with experts’ eyes, evaluate them with appropriate criteria, and then finally compile the necessary information. We, Project for the Dietary Reference Intakes, have been playing a core role in this process. In other words, our project aims to make “a measure to support health of Japanese people from the nutrition point of view.” However, our project alone is not working on all these tasks and we work with the experts of our institute and those of other institutes. In this process, we play the role as a coordinator. About 100 scientists were involved in the formulation of “DRIs for Japanese, 2005,” and in total over 50,000 articles and technical documents were collected from all over the world for systematic review.

DRIs is revised and issued every five years. The latest version of DRIs will be used until the fiscal year 2009. We have started preparing the revised one, which will be used from the fiscal year 2010.

Our duty is not only to collect the researches undertaken in other institutes and universities, and we also work on our own researches actively. In particular, our focus is “nutritional epidemiology researches”, where we investigate the associations between nutrient/food intake and health status of Japanese people. Eating habits are very different between Japanese and Westerners. Consequently, the disease structure is also different. For the formulation of ”DRIs for Japanese,” the researches conducted in overseas only can not be enough evidences, and thus the ones targeting Japanese people are required. Although the nutritional epidemiology is relatively behind compared to other fields of nutritional science in Japan, it is actually very important research field which would support health of Japanese people. The mission of our project is quite significant, and thus we feel a heavy responsibility. We will appreciate your continuous support for our project.

Thoughts on Health and Nutrition Research

Health promotion through nutritional supports for exercise and resting

Project Leader, Yasuhiro Fujii
Project for Nutraceutical Research
Center for Collaboration and Partnership

A long and healthy life seems to be an eternal theme for human beings from ancient times. There is a famous story that, around *Jomon* or *Yayoi* Period in Japan, the First Emperor of the State of Qin (*Qin Shi Huang*: 始皇帝) in China dispatched *Xu Fu* (徐福) together with 3,000 young men and women to *Hourai*, a country located in the east (according to one theory, this country means Japan), in search for the elixir of immortality. There are many legends about *Xu Fu* that may or may not be true, all over Japan. You may not have so strong desire for *Immortality* as *Qin Shi Huang* had, but everyone must have a wish for maintaining and promoting one's health. It is also not only *Qin Shi Huang* who would even expect to maintain and promote one's health without a great effort. Resent *fitness boom* can be a good example; people would promptly jump at the foods which are believed effective to lose weight, make the skin younger and treat diseases. When these foods did not work, and if they find new health information, they would try other new foods again, expecting that "It should work for this time!" In this way, many people repeat the same, without realizing that it was false information, which may reflect the people's wish to attain good health without a great effort.

It is widely understood that nutrition, exercise and resting are the important factors for health maintenance and promotion. It must be noted however that people can be healthy and active, only if the above factors could exert the effects each other in a complementary way. In other words, solving the health problems by a separate approach of nutrition, exercise, or resting would make it impossible to reach the final goal of health maintenance and promotion. Let me give you an example of exercise, which requires the biggest effort among those three factors. While 64% of Japanese reported that they were aware of being lack of exercise (Health and Welfare Trend Survey, 2002), 'Walk count' keep decreasing, compared to 5 years ago (National Health and Nutrition Survey, 2002). These data show that many people recognize the need of more exercise for their health, but end up taking no action. We can not expect the behavioral change in these people just by suggesting "Practice more exercises for your health!". Then, how about providing the nutritional support, as a help for increasing the amount of exercises or physical activities for health promotion? For example, usually thirty minutes' exercise is required to have its effect, though what if the time required to have the same effects can be shortened to 15 minutes by taking some kind of nutrients during exercise? Or what if the subsequent fatigue can be reduced by taking some kind of nutrients during exercise, so that one could feel the exercise enjoyable?

I suppose that more people would be willing to start exercise, if we could propose an easier way. In our project, therefore, we work on the researches to look into the nutrients and foods which could enhance the effects of exercise. If we could find evidences on such effects, we could also support the implementation of "Exercise and Physical Activity Reference Quantity (EPARQ) for Health Promotion 2005" which was introduced in the last issue (No. 15) by Dr. Izumi Tabata (Director of Health Promotion and Exercise Program)" from the field of practical nutrition.

Fatigue during exercise would have links to resting. Considering that mental health problems could be possibly affected by nutrients too, there may be a possibility to support resting from the field of nutrition.

As a specialist in the field of nutrition, I would keep working on realization of these hypotheses.

Latest Research

Gly395Arg polymorphism of PPARα gene was not detected in Japanese population of 729 individuals.

Yasutomi Kamei (Nutritional Sciences Program)

All human beings belong to the species, *Homo Sapiens*, but there is variation from one person to another, such as in looks. Our genomic DNA sequences also differ from person to person. This difference in genomic DNA between individuals is called a polymorphism.

Elucidation of the role of each polymorphism of our genes could be useful for determining the susceptibility of each individual to certain diseases. A person, with high-risk DNA polymorphism(s) to certain disease(s), should take precautions to reduce other non-genetic risk factors, including lifestyle. DNA polymorphism is considered to be associated, in particular, with lifestyle-related diseases such as diabetes, hypertension and obesity. In the case of classical genetic diseases, which are caused by a mutation of a single gene, onset of disease can be predicted according to Mendel's law. Obviously, lifestyle-related diseases are caused by modern lifestyles (environmental factors). Meanwhile, genetic factors could also be strongly involved in the onset of lifestyle-related diseases, since some individuals suffer from lifestyle-related diseases while others with a similar lifestyle do not. A combination of multiple DNA polymorphisms is likely to affect the susceptibility to lifestyle-related diseases. In this study, we examined the association between a DNA polymorphism and lifestyle-related diseases, focusing on peroxisome proliferators-activated receptors (PPAR) α gene.

PPARα belongs to the nuclear receptor superfamily, and plays an important role in lipid metabolism, fatty acid oxidation, homeostasis and inflammation. In addition, some effects of dietary fish oil on the human body are considered to be mediated by PPARα.

Several polymorphisms of the human PPARα gene, such as Leu162Val polymorphism (leucine is substituted for valine at amino acid 162) and Val227Ala polymorphism (valine is substituted for alanine at amino acid 227), have been reported in the Japanese and other ethnic populations. Recently, another PPARα polymorphism, Gly395Arg (glycine is substituted for arginine at amino acid 395), was reported in Caucasians and African subjects. The Gly395Arg site is located in the ligand-binding domain of the PPARα gene, which is important for binding ligands, sucha as fatty acid in dietary fish oil. In this study, we focused on the Gly395Arg polymorphism. In collaboration with a pharmaceutrical company (BML, Japan), we established the Invader assay method to search for the Gly395Arg polymorphism in the PPARα gene. We randomly selected 729 Japanese adults for the study. Although the synthesized oligonucleotides of each polymorphism could be distinguished clearly, all 729 individuals had the Gly (G) allele and none had the Arg (C) allele. These data suggest that there is racial variability in the frequencies of Gly395Arg polymorphisms, and also that the Gly395Arg polymorphism is not common in the Japanese. Further studies are needed to investigate the association between other polymorphisms common in the Japanese and lifestyle-related diseases.

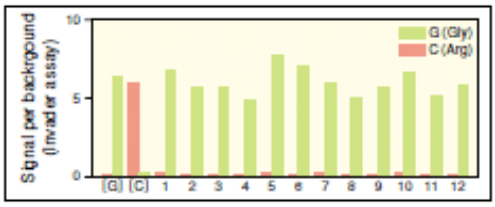

Fig. 1 Detection of Gly395Arg polymorphism by Invader Assay for synthesized DNA ([G] contains G nucleotide and [C] contains C nucleotide) and in 12 Japanese samples. All samples showed predominant green signals, indicating they are homozygotes for G nucleotide (Gly).

Gly395Arg polymorphism of PPARα gene was not detected in Japanese population of 729 individuals.

Journal of Nutrition Science and Vitaminology. 2006; 52: 75-78.

Kamei Y[1),2)], Saito K[1),3)], Yokoyama T[3)], Yoshiike N[1)], Ezaki O[1)] and Tanaka H[1)]

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2) *Tokyo Medical and Dental University, Tokyo, Japan*
3) *National Institute of Public Health, Saitama, Japan*

Abstract: Peroxisome proliferator-activated receptor a (PPARα) is a member of the nuclear receptor superfamily and participates in the regulation of key proteins involved in lipid metabolism, fatty acid oxidation, homeostasis, and inflammation. Several polymorphisms of the human PPARα gene, such as Leu162Val polymorphism and Val227Ala polymorphism, have been described in different races. Recently, another PPARα polymorphism Gly395Arg polymorphism has been reported in Caucasian and African subjects. Using the Invader assay, we searched for this polymorphism in 729 Japanese adults randomly selected in a rural population. Although the synthesized oligonucleotides of each polymorphism could be distinguished clearly, all 729 individuals had the Gly (G) allele and none had the Arg (C) allele. These data suggest that there is racial variability in the frequencies of PPARα gene polymorphisms.

Latest Research

New Quantitative Index for Dietary Diversity and its annual changes in Japan.

Yasuhiro Matsumura (Project for Health Communication)

It is recommended to take the necessary nutrients from various foods. This is called as “dietary diversity”, though there is no universal index by which dietary diversity can be evaluated. Many previous studies have used the number of foods (food groups) consumed during a given period as an index. Because there is no uniformity as to what types of foods are counted and by what method, objective comparison across different populations or time points is difficult. Furthermore, only the number of consumed foods (food groups) can not fully describe quantitative variations of consumed foods. Therefore, this report proposes a new index that takes into consideration the quantitative aspect of consumed foods, by which objective evaluation of dietary diversity across different populations or time points can be possible. We applied this index to the data obtained from the National Nutrition Survey in Japan (J-NNS) between 1957 and 2000, and examined its annual changes. The newly proposed Quantitative Index for Dietary Diversity (QUANTIDD) can be shown in the following formula, where *prop (j)* is the proportion of food group(s) *j* that contribute to total energy or nutrient intake, *n* is the number of food groups.

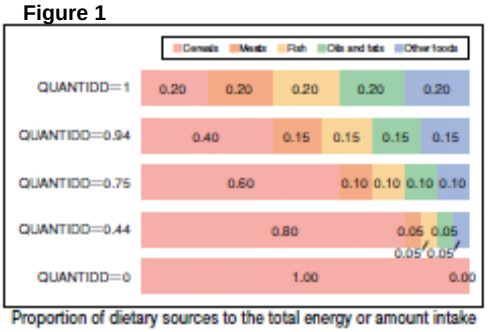
$$QUANTIDD = \frac{1 - \sum_{j}^{n} prop(j)^2}{1 - \frac{1}{n}}$$

This index ranges from 0 to 1. When the food intake sources are equally distributed over all the food groups that constitute them, the QUANTIDD has a maximum value of 1; when the food intake sources are unbalanced and leaning toward only one food group, the QUANTIDD has a minimum value of 0 (**Figure 1**).

We applied this QUANTIDD to the officially released results of J-NNS between 1957 and 2000 (In this study, the numbers of food groups examined were 16). The QUANTIDD of energy intake was about 0.53 in the late 1950s and increased to about 0.8 from the 1960s to the 1970s.Thereafter it continued to gradually increase (**Figure 2**). This figure indicates that, as the years passed, the energy intake sources became less unbalanced. The QUANTIDD of amount of food intake was about 0.83 in the late 1950s and increased by about 0.1 from the 1960s to the first half of the 1970s. It has subsequently been hovering at around 0.93. The value of the QUANTIDD of energy intake is smaller than that of weight intake, because some food groups, such as the vegetable and seaweed, make only a small contribution to energy. Although this study calculated the QUANTIDD in terms of total energy or amount intake only, this index can be calculated for diversity within any food group. Combining these calculations will lead to a detailed understanding of dietary diversity.

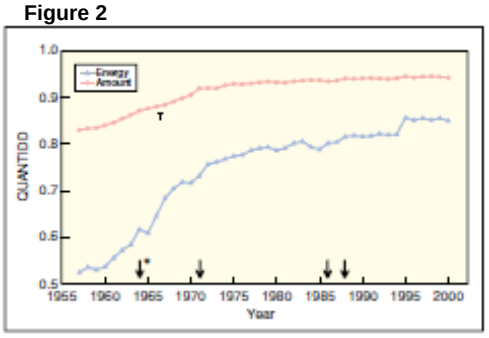
It must be noted however that, while this index reflects a quantitative aspect of dietary diversity, it does not necessarily reflect dietary quality. Besides, when the QUANTIDD is compared with other groups, the study foods (food groups) should be same between groups. Considering these restrictions, we would like you to utilize the QUANTIDD.

Figure 1



Proportion of dietary sources to the total energy or amount intake

Figure 2



New Quantitative Index for Dietary Diversity (QUANTIDD) and its annual changes in the Japanese.

Nutrition. 2006; 22: 283-287

Katanoda K [1], Kim HS [2] and Matsumura Y[2]

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Abstract: **OBJECTIVE:** A diverse diet is recommended in many dietary guidelines. However, because there are no unified standards for measurement methods, objective comparisons across different populations or time points is difficult. This report proposes a new dietary diversity index based on quantitative distribution of consumed foods to allow objective measurement of dietary diversity. **METHODS:** A Quantitative Index for Dietary Diversity (QUANTIDD) is proposed: QUANTIDD=(1-summation operatorjn prop[j]2)/(1-1/n), where prop(j) is the proportion of food group(s) j that contributes to total energy or nutrient intake, n is the number of food groups, and j = 1,2,...,n. The numerator is the probability that the two foods taken out of an aggregation of consumed foods belong to different food groups. The denominator is its maximum value. The index ranges from 0 to 1. By using the officially released average data from the National Nutrition Survey in Japan from 1957 to 2000, we investigated annual changes in the QUANTIDD. We also investigated the distribution of the index by using individual data from the National Nutrition Survey in Japan in 1996. **RESULTS:** The QUANTIDD increased from the 1960s to the 1970s. This was the era of rapid economic growth in Japan, during which the dietary habits of the Japanese underwent rapid changes. The distribution of the QUANTIDD was skewed to the left, but logit-transformation decreased this asymmetry and made it similar to a normal distribution. **CONCLUSION:** Because this index can measure dietary diversity objectively and is suitable for statistical handling, it is useful as a method to compare dietary patterns across different populations or time points.

Latest Research

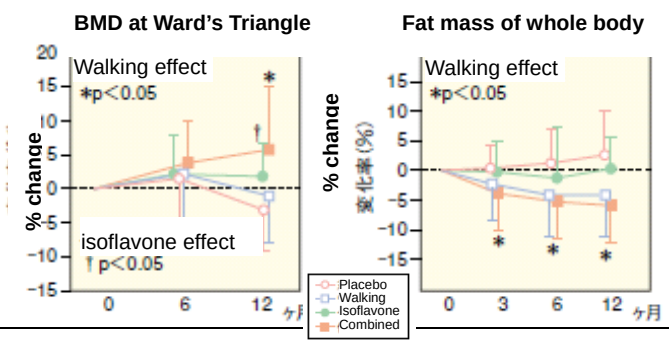
Effects of isoflavone and exercise on BMD and fat mass in postmenopausal Japanese women: a 1-year randomized placebo-controlled trial.

Yoshiko Ishimi (Project for Bio-index)

With advent of the aging society, the increased prevalence of osteoporosis became a significant public health problem in Japan. Determinants of bone mass include genetic predisposition, hormone, nutrition, exercise and lifestyle. In particular, estrogen inhibits absorption in bone and the reduced estrogen secretion by menopause would cause a rapid bone loss. Osteoporosis is a skeletal disorder characterized by bone loss and deterioration of bone microstructure, which predisposes a person to the increased risk of fracture. It is reported that about half the Japanese women experience the bone fracture associated with osteoporosis in their lifetime. Once an old person gets bone fracture, s/he is likely to become bed ridden, which would greatly affect one's quality of life (QOL). Now, the Ministry of Health, Labour and Welfare implements various programs to increase healthy old persons, of which prevention of bone fracture is regarded as the most important strategy.

The most effective methods to prevent osteoporosis are to increase peak bone mass to the maximum in one's youth, and also to suppress the bone loss in one's midlife. Exercise is one of the preventive methods of osteoporosis which can be practiced in one's daily life. However, for women, estrogen deficiency decreases bone response to exercise. We therefore examined the combined effects of soy isoflavone intake and exercise on bone metabolism and lipid metabolism in the postmenopausal Japanese women. In this study, 136 healthy postmenopausal women who were within 5 years of natural onset of menopause were recruited, and were randomly assigned to four groups: 1) placebo, 2) placebo + walking (45 minutes/day at 6km/h, 3 days/week), 3) isoflavone (isoflavone glycosides equivalent to 2/3 of *tofu*) and 4) isoflavone + walking. After 1 year Intervention, bone mineral density (BMD), fat mass and serum lipid were assessed. BMD in femur decreased in placebo group, whereas walking showed significant effects on the preservation of BMD in the total hip and at Ward's triangle which consists of trabecular bone. Interventions with isoflavone moderately preserved BMD at Ward's triangle. And, isoflavone intake + walking preserved BMD in the total hip and also increased BMD at Ward's triangle (**Figure**).

On the other hand, fat mass increased in placebo group, whereas it decreased in the whole body, trunk, legs and arms for walking group (right **Figure** for the whole body). Isoflavone intake suppressed the abdominal fat accumulation. Interestingly, the HDL-cholesterol concentration significantly increased in the walking group. These findings would suggest that daily intake of isoflavone combined with walking exercise could have a positive effect on BMD and lipid metabolism in postmenopausal Japanese women. No significant change of serum concentrations of estradiol was observed in any group. Soybean contains not only isoflavone but also soy protein that decreases the cholesterol concentration. Walking exercise 3 times/week together with adequate intake of soy products could have a greater effect on preventing lifestyle-related diseases such as osteoporosis, obesity and hyperlipidemia in postmenopausal women. Needless to say, it is essential to keep a balanced diet with high Ca content, as well.



Effects of isoflavone and exercise on BMD and fat mass in postmenopausal Japanese women: a 1-year randomized placebo-controlled trial.

Journal of Bone and Mineral Research. 2006; 21(5): 780-789

Wu J[1], Oka J[2], Tabata I[3], Higuchi M[3], Toda T[4], Fuku N[3], Ezaki J[1], Sugiyama F[1], Uchiyama S[5], Yamada K[1],Ishimi Y[1]

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Abstract: The combined intervention of isoflavone intake and walking exercise over 1 year in postmenopausal Japanese women exhibited a trend for a greater effect on prevention of bone loss at the total hip and Ward's triangle regions. **INTRODUCTION:** The additive effects of isoflavones and exercise on bone and lipid metabolism have been shown in estrogen-deficient animals. In this study, we determined the effects of isoflavone intake, walking exercise, and their interaction on bone, fat mass, and lipid metabolism over 1 year in postmenopausal Japanese women. MATERIALS AND **METHODS:** A total of 136 postmenopausal women at <5 years after the onset of menopause were randomly assigned to four groups: (1) placebo, (2) walking (45 minutes/day, 3 days/week) with placebo, (3) isoflavone intake (75 mg of isoflavone conjugates/day), and (4) combination of isoflavone plus walking. BMD, fat mass, serum lipid, and serum and urinary isoflavone concentrations were assessed. **RESULTS**: A significant main effect of isoflavone on the reduction in trunk fat mass was obtained at 12 months. Significant main effects of walking on the reduction in fat mass in the whole body and the trunk were observed at 3, 6, and 12 months and that in the legs and arms at 6 and 12 months. Serum high-density lipoprotein (HDL)-cholesterol concentration significantly increased by 12 months after the walking and the combined intervention. After 12 months, a significant main effect of isoflavone on BMD was observed only at Ward's triangle. Walking prevented bone loss at the total hip and the Ward's triangle to significant degrees. The effect of the combined intervention on BMD at total hip and Ward's triangle regions was greater than that of either alone. No significant interaction was observed between isoflavone and walking in any measurements recorded during the study . **CONCLUSIONS:** Our study suggest that combined intervention of 75 mg/day of isoflavone intake and walking exercise 3 times/week for 1 year showed a trend for a greater effect on BMD at total hip and Ward's triangle regions than either alone. Intervention with isoflavone in postmenopausal Japanese women showed a modest effect on BMD compared with those in Westerners. Further studies over longer treatment duration that include assessment of BMD at various regions are necessary to ascertain the clinical significance of the combined intervention of isoflavone plus walking in postmenopausal women.

Latest Research

A new attraction of sea food: Taurine deficiency creates a vicious cycle promoting obesity

Nobuyo Tsuboyama-Kasaoka (Nutritional Sciences Program)

It is speculated that a fish- rather than meat-based diet is beneficial in one's health. In fact, there are evidences from the researches on nutrients contained in fish and seafood. Taurine is one of the amino acids, which is contained in sea foods like oyster, squid etc. It is known that dietary taurine improves the functions of heart and liver, and reduces the cholesterol level in blood. Yet, its effect on obesity has been still unclear.

Taurine can be obtained by dietary ingestion, as well as by *de novo* synthesis. The key enzyme in the taurine biosynthetic pathway is cysteine dioxygenase (CDO) in the liver. In addition, the previous studies explored that CDO mRNA is also expressed in white adipose tissue (WAT). Interestingly, the biosynthesis of taurine in WAT was observed in the mice who became obese by high-fat diet. Since blood taurine concentration also decreased, it was likely that obese mice would become taurine deficient.

In this study, we found that even high fat diet did not lead to obesity, when it was supplemented with taurine (**Figure 1**). In taurine-fed mice, the basal metabolic rate increased and gene expression involved in lipolysis also increased in WAT. It can be therefore assumed that taurine may work on fat combustion. An excessive fat accumulation in WAT would cause depletion of the blood taurine concentration, which then promotes further obesity, creating a vicious circle (**Figure 2**). Dietary taurine supplementation interrupts this vicious circle and might prevent obesity, by enhancing the weakened function of blood taurine.

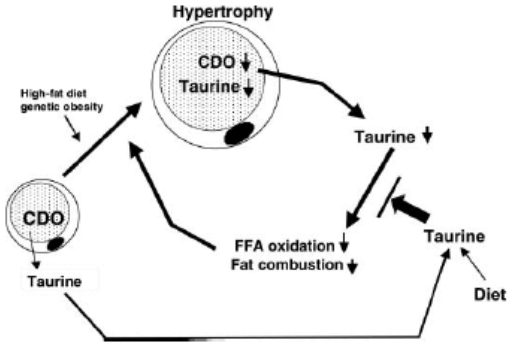
According to the latest studies, WAT is known not only for its function to accumulate fat, but also as adipocytes where hormone-like adipocytokines are secreted. Thus, although not a classical hormone, taurine could be a new adipocytikine with the effects of preventing obesity and diabetes. This is an interesting phenomenon that a nutrient could adjust the physical function like this.

It must be noted, however, that out results were derived from high-fat diet fed mice with lots of taurine (equivalent to 150g taurine for a person with 50kg body weight). Further studies are needed to examine the effectiveness of taurine supplementation in obese human subjects.

Figure 1. After 18 weeks of experimental feeding

High-carbohydrate Diet fed mice | High-fat diet fed mice | High-fat diet + taurine fed

Figure 2. Proposed model of taurine-mediated vicious circle in obesity



Taurine (2-aminoethanesulfonic acid) deficiency creates a vicious circle promoting obesity.

Endocrinology, 2006; 147:3276-3284

Tsuboyama-Kasaoka N[1], Shozawa C[1], Sano K[2], Kamei Y[3], Kasaoka S[1], Hosokawa Y[4] and Ezaki O[1]

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2. Department of Health and Nutrition, Bunkyo University Women's College, Kanagawa, Japan
3. Medical Research Institute, Tokyo Medical and Dental University, Tokyo, Japan
4. Department of Food and Health Sciences, Jissen Women's University, Tokyo, Japan

Abstract:

The relation between blood taurine (2-aminoethanesulfonic acid) concentrations and obesity was investigated. Taurine is supplied to the body by dietary ingestion as well as by de novo synthesis; it is anabolized by cysteine dioxygenase (CDO), which is abundantly expressed in liver and white adipose tissue. Overexpression of CDO in 3T3-L1 preadipocytes caused a decrease in the level of cysteine (precursor of taurine) and an increase in the level of taurine in the culture medium, suggesting that CDO is involved in biosynthesis and secretion of taurine in white adipose tissue. In high-fat diet-induced and/or genetically obese mice, a decrease in the blood taurine concentration was observed along with a decrease in CDO expression in adipose tissue but not in liver. Dietary taurine supplementation prevented high-fat diet-induced obesity with increased resting energy expenditure. Thus, taurine deficiency observed in association with obesity may create a vicious circle promoting obesity. Dietary taurine supplementation interrupts this vicious circle and may prevent obesity.