May 30, 2024

Collaborative research between Hirosaki University and Megmilk Snow Brand shows that bone turnover markers and bone strength are associated with consumption of dairy foods in Japanese adults

Hirosaki University (President Masasaku Fukuda) and MEGMILK SNOW BRAND Co., Ltd. (headquarters: Shinjuku-ku, Tokyo; Representative Director and President: Masatoshi Sato; hereinafter, "Megmilk Snow Brand") have conducted a cross-sectional study on dairy foods consumption, bone turnover markers, and osteo-sono index in residents of the Iwaki area of Hirosaki City, Aomori Prefecture. The results suggest that consumption of milk and dairy products is associated with bone metabolism markers and osteo sono index that indicate bone health status, contributing to nutritional supplementation for bone health.
The research results were published in Bone Reports, an international journal on bone research.

Megmilk Snow Brand participated in this research as a participating institution of the Hirosaki University COI-NEXT Center, which possesses health big data from the Iwaki Health Promotion Project.
Megmilk Snow Brands is continuing to explore the health benefits of milk and dairy products in Japanese through big data analysis as well as the R&D pipelines of dairy and probiotic products, which are the heritage of the Company's roughly 100 years of history.

■Presentation Overview

Title of paper: Dairy consumption, bone turnover biomarkers, and osteo sono assessment index in Japanese adults: a cross-sectional analysis of data from the Iwaki Health Promotion Project）

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■Key Points of the Paper's Contents

・The study used health big data from Japanese adults, analyzing the relationship between milk and dairy product consumption and bone health.

・The association between milk and dairy product intake and bone turnover markers and bone strength parameters suggests that habitual consumption of milk and dairy products contributes to the nutritional requirements for bone health in Japanese adults, even at consumption levels lower than those typically seen in Western populations.

[Paper abstract]

○Background and Objectives

Milk and dairy products are foods that contain a balance of many nutrients, including essential nutrients such as protein, calcium, and vitamin D, as well as useful nutrients found in fermented foods such as lactic acid bacteria and *Bifidobacterium*. Fractures are a risk factor for mortality, and osteoporosis increases the risk of fractures. Milk and dairy product intake is beneficial for bone health, but the association between detailed bone health status and milk and dairy product intake is not clear in Japanese.

The modern Japanese diet is a mixture of traditional Japanese food, as represented by conventional Japanese cuisine, and Western food, and although yogurt consumption is relatively high, milk and cheese consumption is low compared to the rest of the world. This study examined the relationship between milk and dairy product intake and bone metabolism markers and osteo-sono index (OSI) in local residents of the Iwaki area of Hirosaki City, Aomori Prefecture.

○Methods

■Subjects: 1,063 participants with food frequency questionnaire, bone metabolism markers, and OSI test results from the 2015 Iwaki Health Promotion Project Health Examination.

■About Measurement

(1) Bone metabolism markers:

Milk and dairy product intake was calculated using the dietary history method, and the concentrations of six bone metabolism markers in blood were measured at an outside clinical laboratory.

(2) Osteo-sono index (OSI):

Bone strength was measured as OSI with an ultrasound bone densitometer.

(3) Food frequency questionnaire

Milk and yogurt consumption, including low-fat, regular and high-fat, and total, were estimated using a brief-type self-administered diet history questionnaire completed the previous month during a visit for medical checkup.

■About Analysis

We analyzed the effects of milk and dairy product intake on the results adjusted for age and sex (multiple regression analysis).

○Results

The results of the analysis of health big data from 1,063 subjects showed the following.

■The higher the consumption of low-fat milk and dairy products,

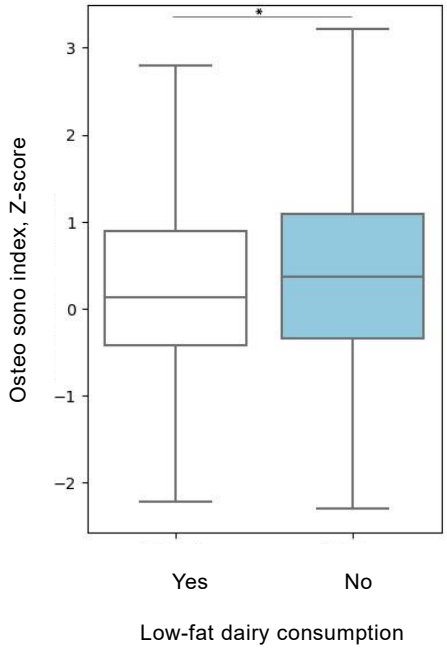
・the lower the bone resorption markers, which are indicators of bone breakdown

・the higher the bone strength values

■The higher the consumption of regular and high-fat milk and dairy products, the higher the bone formation markers, indicating new bone development

■The higher consumption of milk and dairy products, the likelier a maintained balance of parathyroid hormone that regulates bone metabolism

These results suggest that habitual consumption of milk and dairy product contributes to nutritional supplementation for maintaining bone health, including turnover and structure. Further studies are needed to determine clinical implications of these associations in bone health in Japanese adults.



[Osteo-sono index (OSI)]
It is an index to evaluate bone strength calculated from the ultrasonic velocity and transmission index of the calcaneus (heel bone).
The Z-score is calculated from the mean and standard deviation of bone strength in the same age group.
[Left figure (box-and-whisker diagram)]
The difference in the distribution of OSI Z-scores with and without intake is illustrated in the figure, showing that the group with intake had higher bone strength parameters.

Figure: Daily intake of low-fat milk and dairy products and osteo-sono index (adapted from the paper)
* $P < 0.05$, Mann-Whitney U-test

[Related Press Release]
・Establishment of a new collaborative research laboratory with Megmilk Snow Brand: Department of Precision Nutrition for Dairy Foods, Graduate School of Medicine, Hirosaki University
(April 14, 2023: https://www.meg-snow.com/news/2023/18433/)

[Department of Precision Nutrition for Dairy Foods]
The purpose of this collaborative research laboratory is to investigate the association between dairy-adopted modern Japanese diets and the broader context of human health, considering the gut microbiome, by analyzing the big data encompassing numerous health markers from annual medical checkups of the Iwaki Health Promotion Project managed by Hirosaki University.

(*1) Hirosaki University COI-NEXT Center
Hirosaki University was selected by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the National Institute of Science and Technology Agency (JST) for the Co-Creation Opportunity Formation Support Program (COI-NEXT) in October 2022. The Hirosaki University COI-NEXT Center aims to create an attractive healthcare industry as a growth industry in which young people want to work in the region with a focus on health, thereby creating a model of a well-being community in which local people are healthy and the economy

develops, people of all generations can continue to work with a sense of fulfillment, and the QOL of both mind and body is high, extending healthy life expectancy. This project aims to form an independent industry-academia-government co-creation center that continuously produces results by inheriting the achievements of the Hirosaki University COI Center.

(*2) Iwaki Health Promotion Project and Hirosaki University COI Center
Hirosaki University has been continuously conducting a large-scale joint health survey in the Iwaki district of Hirosaki City, Aomori Prefecture since 2005, recording enormous health big data by establishing a huge number of health checkup items, about 3,000 items, which is unprecedented in the world. Hirosaki University was selected for the Center of Innovation (COI) Program by the Ministry of Education, Culture, Sports, Science and Technology and JST in 2013, after which the Hirosaki University COI Center facilitated early detection of dementia, lifestyle-related diseases, and so forth, created and verified preventive methods, and conducted research activities for social implementation of the results, based on analysis of super-multiple-item health big data from the Iwaki Health Promotion Project medical checkup. (2013 to 2022)