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Construction of an Evaluation System for Magnesium Intake Deficiency Using Biomarkers

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Summary

In recent years, dietary changes, unbalanced diets, use of processed foods, and soil alteration due to the use of chemical fertilizers have caused inadequate intake of micronutrients, namely minerals. In Japan, average intakes of calcium, magnesium, iron (women), zinc, and other minerals do not reach the estimated average requirement or recommended amounts specified in the Dietary Reference Intakes for Japanese. Similarly, countries around the world are also inadequate in their intake of various minerals. Insufficient mineral intake is an obstacle to maintaining good health and quality of life. On the other hand, there are few opportunities for individuals to recognize mineral deficiencies. For example, only Na, K, and Cl are examined in blood tests during physical examinations. The balance of minerals in the blood does not fluctuate unless there is a severe deficiency or excess due to the homeostatic mechanism of the body. In order to maintain health and improve QOL through food, it is necessary to implement a simple and accurate method of detecting mineral deficiency in society. Recently, blood circulating microRNAs (miRNAs) have attracted attention as biomarkers that reflect the state of the living body. In this study, we first identified circulating miRNAs that fluctuate in response to mild magnesium deficiency in an animal model.

In this study, mice were fed a 70% Mg-sufficient diet (7MD) for 14 days to create a model of mild Mg deficiency. As a control group, mice fed a normal diet (Ctl, 100% Mg-sufficient) were used to examine the effect of mild Mg deprivation on blood miRNA levels. The miRNAs in the blood were subjected to miRNA-seq and analyzed, and approximately 25% of all miRNA species were detected. Nine and 7 miRNA species were identified as variable in the Ctl and 7MD groups, respectively, in the two replicated experiments. An increase in the abundance of *mmu-miR-144-5p* was detected as a change. The increased abundance of *mmu-miR-144-5p* in blood was presented as a potential biomarker for mild Mg intake deficiency.

Further reproducibility checks, robustness checks, and biomarker discovery studies using combinations of miRNAs are expected to demonstrate the usefulness of miRNAs as a biomarker for mild magnesium deficiency.