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Study on the Regulation of Gene Expression of an Intestinal Calcium Transporter

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Summary

The daily diet in Japan has been highly evaluated in that it is well balanced. However, the daily intake of one of minerals, calcium, doesn't satisfy a requirement. There are many difficulties for the elderly in aged society to maintain bone homeostasis. In order to solve the issue, it is thought that elevation of calcium absorption rate, not only calcium intake, is also critical. Calcium is absorbed mainly at the small intestine, in which a calcium transporter, CaT1, works. Because gene expression of this transporter is regulated by vitamin D, certain food factors with a vitamin D-like activity are expected to facilitate calcium absorption through an increase in CaT1 gene expression. These factors should bind to the ligand-binding domain in the vitamin D receptor (VDR) to fulfill their biological functions. In the current study we attempted to establish a novel assay system to evaluate the VDR ligand activity of food factors. Using cultured cells expressing VDR and a reporter gene with VDR response elements, luciferase activities were measured. From among approximately 200 purified compounds derived from foods, two molecules of flavonoids were found to be active. These compounds, indeed, elevated CaT1 gene expression in the human cultured intestinal cells, Caco-2. These results demonstrate that this assay system is competent to evaluate the vitamin D-like functions of food factors. Further studies are required to verify that these flavonoids are capable to facilitate calcium absorption from the small intestine.