

The Surface Analysis by Flow Cytometry on the Balance of Calcium and Magnesium Intakes

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Summary

In the United States in 2010, it has been also reported that inadequate intake of magnesium is approximately 60% among adult population, associating with increasing of obesity, arteriosclerosis, hypertension, osteoporosis, diabetes, and cancer. Chronic inadequate intake of micronutrients as Mg was also suggested one of the risk factors for the cardiovascular diseases such as heart disease and stroke. In the present study, the effects of balance of calcium (Ca) and Mg intakes on the immune function among Diabetes modeled mice were tested by the surface analysis of immunocompetent cells using flow cytometry.

Four-week-old male ICR mice, intraperitoneally administered two times (weight 100 mg/kg) of streptozotocin, were induced type 1- diabetes. Mice were divided into 8 groups (Control group, Mg deficient group (MgD), high Ca group (HCa), MgD+HCa group (MgD+HCa), Diabetes Mellitus (DM) group, DM+MgD group (DM+MgD), DM+HCa group (DM+HCa), DM+MgD+HCa group (DM+MgD+HCa) with 6 animals in each group fed the basal diet (AIN-93G, using a mixture of minerals, including magnesium oxide), or the Mg deficient diet or the high Ca diet including twice Ca compared to AIN-93G for 3 weeks. Food intake and body weight were measured daily and after the autopsy, blood, thymus and spleen were collected and weighed. Blood glucose and Mg concentrations were measured. In addition, the blood, spleen and thymus were applied to a surface analysis by flow cytometry.

Serum Mg concentration which is an indicator of Mg status of the body, showed significantly lower and was apparently confirmed to be Mg deficient state among MgD, MgD+HCa, DM+MgD, and DM+MgD+HCa groups compared to the control group. We also confirmed mice were suffered from diabetes based on the blood glucose which was significantly higher among DM, DM+MgD, DM+MgD+HCa groups than the control group. The thymus and spleen weight in MgD group were significantly higher than in control group. NK cells in thymus of MgD+HCa mice showed significantly higher than in MgD mice. NK cells in thymus of DM+MgD and DM+MgD+HCa mice showed significantly higher than in DM mice. T cells in serum of MgD+HCa mice were significantly higher than control. B cells in serum of MgD and MgD+HCa mice were significantly lower than control. Also, T cells and helper-T cells in serum of HCa mice were significantly lower than control. B cells in serum of HCa mice was tend to be higher than control, MgD, DM+HCa groups, respectively.

It was reported that the Mg deficiency or diabetes lowered the resistance to infection increasing lymphocytes and lymphoid tissues. There is no contradiction among our results showed that NK cells, which are lymphocytes for biological defense has increased by Mg deficiency or diabetes. Also, when is Mg deficiency or diabetes, by increasing the percentage basis T cells than B cells, and is a high Ca state, by increasing the percentage basis B cells than T cells, that forms the body's defense system by limited immunocompetent cells was suggested.