

No. 0914

Contribution of Dietary Zinc to the Function of Intestinal Epithelia and Mucosal Immune System

Satoshi Ishizuka

Research Faculty of Agriculture, Hokkaido University, Sapporo 060-8589, Japan

Summary

Zinc is involved in many cellular functions. We previously found that zinc concentration in serum was strictly regulated by dietary zinc. Severe anorexia was found in zinc deficiency induced by ingestion of zinc-depleted diet. In contrast, marginal zinc deficiency (MZD, 5 mg Zn/kg diet) did not develop any apparent diseases. In this study, we investigated whether dietary zinc level modulates epithelial functions including proliferation and responses in experimental colitis induced by administration of dextran sulfate sodium (DSS). Male WKAH/HkmSlc (3 weeks old) were fed AIN-93-based diet containing 0 (zinc deficiency, ZD), 5, 10 or 30 mg Zn/kg diet for 4 weeks after acclimation. Pair-feeding for ZD was also performed to monitor an influence of food restriction in ZD rats. We determined bromodeoxyuridine (BrdU) incorporation and crypt fission in intestinal epithelial cells as well as serum zinc concentration. There was no significant difference in BrdU incorporation and crypt fission in intestine between the groups. However, serum zinc concentration strictly depended on the dietary zinc concentration. In the second experiment, male WKAH/HkmSlc (3 weeks old) were fed AIN-93-based diet containing either 5 (marginal zinc deficiency, MZD) or 30 mg Zn/kg (zinc adequate, ZA) diet for 2 weeks after acclimation. Serum concentration of zinc was almost one-third in rats fed MZD rats compared to that in ZA at this point. We investigated influence of MZD on DSS-induced colitis in the same experimental design. The rats were administered 2% DSS in drinking water after analysis of the serum zinc concentration. We measured disease activity index (DAI), myeloperoxidase (MPO) activity, and TNF α production in colonic mucosa in MZD and ZA rats. As a result, MZD enhanced DAI, colonic MPO activity, and colonic TNF α production. These results suggest that MZD exacerbates experimental colitis without retardation of epithelial barrier.