

Enhancement of the inhibitory activity of food protein hydrolysates by sodium chloride on calcium carbonate crystallization

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Summary

Some acidic peptides have been shown to improve the passive calcium absorption from the small intestine by inhibiting the precipitation of calcium salts and increasing the concentration of soluble calcium. In this study, we hydrolyzed soybean protein, wheat gluten, rice bran protein and egg white albumin, under different conditions with various proteases, and investigated their inhibitory activities of the hydrolysates on the crystal growth of calcium carbonate. Each hydrolysate showed different strength of the activity, suggesting the key role of the structure of peptides for the activity. The activities increased by treating the protein hydrolysates with glutaminase accompanying an increase of the resistance against peptic digestion.

The inhibitory activities of protein hydrolysates on the calcium carbonate crystallization were enhanced by the addition of lactose or citrate into the reaction mixtures. Although sodium chloride itself had no effect on the inhibitory activity, the activity increased in the presence of protein hydrolysates by increasing the concentration of sodium chloride over 0.5%. Sodium chloride and lactose were not synergistic in the activity.

The molecular interactions, which take place at the interface between peptide molecules and calcium ions on the crystal surface, must be important for the inhibition of crystal growth. A direct effect of peptides was demonstrated by suppressing the pH decrease by the addition of protein hydrolysates after the nucleation had started and crystal growth was in progress.