SB-3

Food Factors and Prevention of Common Diseases

Teruyoshi Yanagita
Saga University, Japan

Obesity, hyperlipidemia and diabetes have been increasing in affluent countries, concomitant with changes in dietary habits and lifestyle. Therefore, there has been more interest in the ameliorative effects of food factors to prevent or treat these diseases. Recently, certain food ingredients were reported to be effective for the primary prevention of such diseases. At this meeting, I will show some examples of the preventive effects of the food factors, cycloalliin, CLA and DAG, on obesity and hyperlipidemia.

(1) Hypolipidemic action of cycloalliin

Cycloalliin is a cyclic sulfur-compound found in onions. Levels of the compound increase during cooking accounting for about 50% of all sulfur-compounds. Our study indicated that feeding of cycloalliin to rats reduced serum triacylglycerol (TAG) and cholesterol ester. Cycloalliin inhibited microsomal TAG transfer protein (MTP), an essential protein for apolipoproteinB-containing lipoprotein assembly and secretion, without affecting lipid synthesis. We demonstrated for the first time that cycloalliin and related compounds prevent VLDL assembly and secretion in the liver.

(2) Antiobesity of conjugated linoleic acid (CLA)

CLA is a mixture of positional and geometric isomers of linoleic acid, which is found preferentially in dairy products and meats. CLA mostly contains cis-9,trans-11 and trans-10,cis-12 isomers and has been suggested to have favorable physiological effects, including anti-tumor and anti-diabetes activities. We demonstrated recently that trans-10,cis-12 CLA isomer, but not cis-9,11-trans CLA, feeding resulted in reduced abdominal adipose tissue weight and serum TAG level in obese/diabetic OLETF rats. Trans-10,cis-12 CLA isomer reduced the apolipoproteinB100 and TAG secretion in human liver cells, HepG2. Furthermore, we found that trans-10,cis-12 isomer could prevent obesity through an enhancement of energy expenditure and fatty acid b-oxidation in muscle and adipose tissues. In conclusion, trans-10,cis-12 CLA isomer is responsible for the prevention of obesity and hyperlipidemia.

(3) Functions of diacylglycerol (DAG)

DAG is a component of dietary lipids. It is reported that DAG suppresses postprandial hypertriglyceridemia and reduces adipose tissue in experimental animals and humans. The mechanisms for these effects are not fully apparent. We studied the effect of DAG on postprandial lipid metabolism in rats. Male rats were administered DAG(carboxyl-

14C) or TAG (carboxyl-14C) into the thoracic duct via a stomach tube. At 24 h after administration, the recovery of 14C-dioleoylglycerol in lymph was significantly lower than that of 14C-TAG. At 1 h after administration, the recovery of DAG was almost half of the amount of TAG recovered. The mass amounts of TAG and phospholipid secreted in lymph were also significantly lower 1 h after administering DAG. These results suggest that slow absorption and secretion of DAG could be responsible for the suppression of postprandial hyperlipidemia and antiobesity actions seen with DAG.

References

1. Han SY, et al. 2002. S-Propyl-cysteine sulfoxide and DL-methionine sulfoxide inhibit the secretion of apolipoprotein B100 secretion and lipids in HepG2 cells. *J Oleo Science* 51: 243-250.
2. Yanagita T, Han SY, et al. 2002. Cycloalliin reduces serum TG in rats. *Nutrition* 18: accepted.
3. Han SY, et al. 2001. S-Propyl cysteine reduces apolipoprotein B100 and triacylglycerol secretion in HepG2 cells. *Nutrition* in press.
4. Rahman SM, et al. 2001. Effects. of conjugated linoleic acid on serum leptin concentration, body fat accumulation and beta-oxidation of fatty acid in OLETF rats. *Nutrition* 17: 385.
5. Rahman SM, Yanagita T, et al. 2001. Effects of short term administration of CLA on lipid metabolism in white and brown adipose tissues of starved/refed OLETF rats. *Food Res Int* 34: 515.
6. Yanagita T, et al. 2001. Comparison of lymphatic absorption of 1,2-DG, 1,3-DG and TG. 17th Int. Congress of Nutrition (Vienna), Proceeding abstract p 91.
7. Rahman SM, et al. 2001. Effects of short term administration of conjugated linoleic acid on lipid metabolism in white and brown adipose tissues of starved/refed OLETF rats. *Food Research Int* 34: 515.
8. Rahman SM, et al. 2001. Effect of conjugated linoleic acid on serum leptin concentration, body fat accumulation and beta-oxidation of fatty acid in OLETF rats. *Nutrition* 17: 385.
9. Yanagita T, Wang YM. 2001. Nutritional functions of food lipids. *Sci & Technol* 75: 44-52.
10. Yanagita T, Han SY. 2000. Nutraceutical action of sulfur-compounds in onion. *Bioscience and Industry* 58: 855-858.
11. Yanagita T, Yotsumoto H. 1999. Regulation of microsomal TG transfer protein (MTP) by food ingredients and cholesterol synthetic inhibitor. *Rinsho to Kenkyu* (Clinic and Research) 76: 2208.
12. Yotsumoto H, et al. 1999. 10trans,12cis-Linoleic acid reduces apolipoprotein B100 secretion in HepG2 cells. *Food Res Int* 31: 403.