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Bioavailability and Functions of Lipophilic Components of Food

*Eiichi Kotake-Nara**

Food Research Institute, National Agriculture and Food Research Organization, Japan

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Although carotenoids are typical lipophilic components contained in foods and have various functions, their bioavailability is low. Here we assess the bioavailability and functions of food carotenoids. Carotenoids are released from food matrix, solubilized, and taken up by intestinal cells; subsequently, they are secreted into the lymph, are metabolized, and then exhibit their functions. In particular, solubilization and intestinal absorption are important processes in bioavailability. Oils and fats generally increase the bioavailability of fat-soluble ingredients. Using an in vitro digestion test, carotenoids can be easily solubilized by oils and fats [1]. The intestinal absorption of carotenoids by human intestinal Caco-2 cells is enhanced by lysophospholipids and lysoglycerolipids [2,3]. Lipids regulate bioavailability by affecting both solubilization and intestinal absorption. The enhancing effect of lysolipids on intestinal absorption cannot be exhibited in floating Caco-2 cells treated with trypsin, but when the cultivation duration and intercellular integrity are increased, the enhancing effect is exhibited, suggesting that the intercellular junction is responsible for the effect. After intestinal absorption, carotenoids or any metabolites may exhibit their functions. Vitamin A is a typical metabolite example; however, we investigated the anti-obesity and anti-inflammatory effects of non-provitamin A lutein metabolites using 3T3-L1 and RAW 264 cells, respectively. It is known that 3′-hydroxy-ε,ε-carotene-3-one, a lutein metabolite present in the human blood [4], exhibits stronger effects than lutein [4,5], andthe α, β-unsaturated carbonyl structure of the metabolite may be involved in their functions. Thus, solubilization, intestinal absorption, and metabolism are important factors for the function of carotenoids. We believe that the association between bioavailability and the function of some other lipophilic components is similar to that between bioavailability and carotenoids.

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Correspondence:
Eiichi Kotake-Nara, Food Research Institute, National Agriculture and Food Research Organization, Japan, E-mail: ekotake@affrc.go.jp

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