Health Beneficial Effects of Food Factors Can Be Applicable to Humans?
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Introduction to serial reviews: health beneficial effects of food factors can be applicable to humans?

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A huge number of reports concerning food factors have been published, claiming beneficial health effects. However, these reports often include several critical questions; whether the beneficial effects can be reproduced in humans, whether the beneficial factors produce side effects, and whether the effects are biologically beneficial or toxic.

Many of these reports employed cell lines to examine the effects of food factors. In humans, dietary food factors first pass through the digestive tract and undergo selection to be incorporated into blood in the intestinal epithelium. The data obtained in cell line experiments are not applicable to humans. Food factors are classified into nutrients and non-nutrients. Nutrients are sugars, lipids and proteins, and undergo decomposable catabolism and finally produce ATP energy. Vitamins and minerals, being essential in nutrient catabolism, are also classified as nutrients. The nutrients are recognized by transporters in the epithelium and incorporated into the blood circulation, or are recognized by endogenous carrier proteins after incorporation by simple diffusion into epithelium. In contrast, non-nutrients cannot undergo catabolism and cannot produce ATP. Thus, if absorbed into the body, non-nutrients exist as the same chemical forms in foods because they do not undergo catabolism. Chemicals that cannot undergo catabolism act randomly on biologically important components and exhibit diverse bioactivities, and then disrupt the homeostasis of the metabolism. To avoid disruption, the epithelium inactivates non-nutrients by conjugations such as glucuronization and sulfation before incorporating them into the blood, or excretes them onto the lumen side.

A small amount of incorporated non-nutrients is excreted into urine after short circulation in the blood. Non-nutrients in food include around 8,000 species of phenolics, including phenylpropanoids, flavonoids and anthraquinones; about 25,000 terpenoids, including terpenes, carotenoids, xanthophylls, and iridoids; 12,000 alkaloids, and several sulfate-containing chemicals such as isothiocyanates and sulforaphane. Among these non-nutrients, bioavailable substances for the health beneficial effects are limited when ingested by humans.

Animal experiments provide evidence for the health beneficial effects of various food factors. Animals can select non-nutrients for incorporation into the epithelium; however, most experimental animals are nocturnal and differ in circadian rhythm form humans. The questions remains whether the data obtained in animal experiments can be applied to humans.

In this serial review, bioavailable and effective food factors in humans, factors converted into be highly bioavailable and effective forms in the intestinal flora of the human digestive tract, factors that can exhibit modulating activity on the immune response by affecting the intestinal epithelium, the validity of the results of animal experiments for humans, and a new theory that the health beneficial effects of non-nutrients modulate the quality control system of endogenous proteins, will be discussed.

References


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