

【Grant-in-Aid for Scientific Research (S)】

Biological Sciences (Agricultural Sciences)

Title of Project : Life science basis of short-lived reactive species originated from foods



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Research Project Number : 17H06170 Researcher Number : 40203533

Research Area : Agricultural Chemistry, Food Sciences

Keyword : Short-lived molecules, innate immunity, polysulphides, protein folding

【Purpose and Background of the Research】

Diets rich in vegetables are associated with a reduced risk of several major diseases, including cancers, diabetes, hypertension, and heart disease. It has been shown that non-nutritive plant chemicals, including polyphenols and sulfur compounds, in plant vegetables play a critical role in their beneficial effects. These functional ingredients produce various intermediates via metabolism that are extremely unstable and highly reactive toward biological components, such as proteins. Modification of proteins by these reactive species is suggested to be closely associated with the regulation of protein functions, showing their beneficial effects on human health. Thus, it can be speculated that plant-derived food molecules show their intrinsic health-related function via production of these reactive intermediates followed by interaction with proteins.

The aim of this project is to characterize unstable short-lived reactive species originated from foods and establish novel gain-of-function mechanism of proteins through covalent interaction with these molecules, thereby contributing to biological events (Fig. 1).

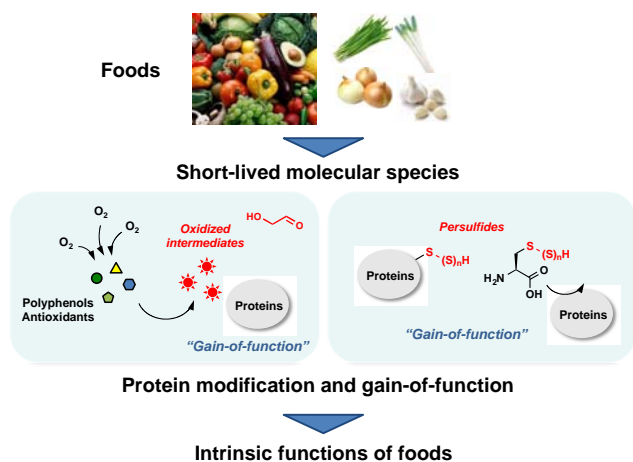


Fig.1. Function of food-derived short-lived reactive species in health.

【Research Methods】

Following items regarding the short-lived reactive species, including antioxidant metabolites and persulfides, will be specifically focused.

1. Identification and detection of short-lived reactive species derived from antioxidants
2. Gain of new function of protein by short-lived antioxidant intermediates
3. Protein persulfidation by persulfide molecules
4. Regulation of intracellular protein function by short-lived reactive species.

【Expected Research Achievements and Scientific Significance】

It is expected that some of the intrinsic functions of antioxidants, such as polyphenols, are proved to be due to their unstable short-lived reactive species. It is also expected that persulfides, a novel active sulfur species, are established as a new signal molecule derived from foods. A research area on the basis of the production of these reactive species originated from foods will be launched.

【Publications Relevant to the Project】

- Hatasa *et al.* (2016) Oxidative deamination of serum albumins by (-)-epigallocatechin-3-*O*-gallate: A potential mechanism for the formation of innate antigens by antioxidants. *PLoS ONE* 11(4):e0153002.
- Miyashita *et al.* (2014) Lysine pyrrolation is a naturally-occurring covalent modification involved in the production of DNA mimic proteins. *Sci. Rep.* 4:5343.

【Term of Project】 FY2017-2021

【Budget Allocation】 157,100 Thousand Yen

【Homepage Address and Other Contact Information】

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