



Title of Project : Quality of lipids in biological systems

Makoto Arita
(RIKEN, Center for Integrative Medical Sciences, Team Leader)

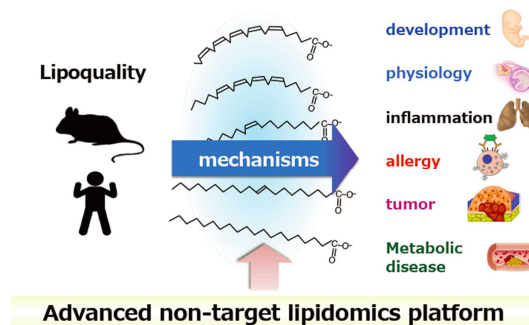
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【Purpose of the Research Project】

Lipids are recognized as extremely diversified molecules, however, the reason for this diversity of lipids is not fully understood. Precise determination of each molecular species of lipids, namely lipoquality (quality of lipids), becomes a prerequisite to understand their biological roles and potential links between lipid metabolisms and biological phenotypes. The purpose of this research project is to understand the functional roles of diverse lipid species in biology, especially focusing on the mechanisms in which specific quality of lipids are required to elicit biological functions.

【Content of the Research Project】

Lipids are a class of hydrophobic molecules that function as structural component of biological membrane, neutral lipids as a major form of energy storage, and lipid mediators as signaling molecules. Quality of lipids (lipoquality) largely affects these three major functions of lipids. For example, quality of membrane lipids and lipid microdomains regulate the function of proteins and thus modify cellular functions. Quality of neutral lipids affects energy homeostasis, and quality of fatty acids such as omega-3 and omega-6 series affects the mediator balance under physiological and/or pathophysiological conditions. Recent advances of mass spectrometry enabled the detailed study of metabolism, distribution and dynamics of individual class of lipids. In this project, we'll develop an advanced non-target lipidomics platform to comprehensively monitor and distinguish different quality of lipids, and thus try to understand how different quality of lipids and their unique metabolites are recognized by target proteins that could explain the biological significance of diverse lipid species in living systems.



【Expected Research Achievements and Scientific Significance】

Since lipids are water-insoluble molecules and are not the primary product of genome, it is still difficult to handle or control. Because of these specific properties, lipid research is lagging behind compared to other life science fields. Advanced mass spectrometry now enables the detailed analysis of lipids, and one of the goals of this project is to develop a hub of advanced non-target lipidomics platform within next 5 years. It is expected to identify novel bioactive lipids by using advanced lipidomics platform. Also visualization of lipid distribution by imaging technology and clarifying molecular interaction of lipids and membrane proteins will provide a new basis to understand the role of specific lipid-protein interaction in membrane biology. Since lipid balance is involved in various biological phenomena, we aim to elucidate how lipid homeostasis is maintained and how disruption of this homeostatic balance can initiate diseases.

【Key Words】

Lipoquality: Functional features of diverse lipid molecular species

【Term of Project】 FY2015-2019

【Budget Allocation】 1,180,100 Thousand Yen

【Homepage Address and Other Contact Information】

<http://lipidbank.jp/lipoquality>
makoto.arita@riken.jp