



Title of Project : Machineries of bioactive lipids in homeostasis and diseases

Term of Project : FY2010-2014

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【Purpose of the Research Project】

Lipids are important as a source of body energy and components of cell membrane. Lipid-derived mediators are also important in intracellular signaling and cell-cell communications, and play pivotal roles in cell proliferation, migration and differentiation. However, lipid-derived mediators are small in their contents and rapidly degraded, making the analysis difficult. Although the research in lipid mediators has been mainly focused on their biosynthetic enzymes and receptors, mass spectrometrical (MS) analysis of lipids are very sensitive and able to detect and quantify scanty amount of lipids directly. Furthermore, accumulation of gene information in various species made it possible to integrate bioinformatics and 'wet' biochemical data.

Under these situations, our team tries to integrate various research groups in Japan to reveal the novel and universal roles of lipid mediators which are common in various species. We also try to identify novel lipid mediators and their machineries in the view of enzymes, receptors and transporters.

【Content of the Research Project】

Our group consists of 9 planned and 16 invited research groups in Japan. We will establish several research centers for MS, animal models (mouse and zebrafish), gene expression, and SNP analysis to support the research of all groups. Nine planned groups target a wide range of lipid mediators such as eicosanoids, anti-inflammatory omega-3 fatty acids, lysophospholipids and sphingolipids, and take approaches from enzyme, receptors and transporters. Furthermore, we are trying to unveil the relationship between uncontrolled lipid machineries and human diseases by integrating the mutations of lipid related genes and lipid homeostasis. One of the final goals is to identify novel lipid mediators by MS analysis and their biosynthetic enzymes, transporters and receptors.

Sixteen invited groups will be selected based on the following criteria: 1)research on a variety of model animals, 2)research using original mouse disease models and analytical approach, 3)research on lipids and human diseases, 4)research on synthetic organic chemistry, and 5)lipid profiling

using MS. We will also exhibit our progress and results through WEB pages, international symposiums, and open classes for citizens.

【Expected Research Achievements】

Our research team is the only comprehensive research team on lipids in the world. As no comprehensive studies on SNP analysis on lipid related molecules have been done, our achievements might lead to the identification of disease-initiating genes and new therapeutic approaches. The final and most important achievement of our research is to establish a new research field that covers all the aspects of lipid mediators namely 'Lipids in Life'. Our research will contribute to many research fields that include signal transduction research, developmental biology, metabolic disease research and immunology. We also expect to change the general concept of lipids as 'bad guys for health' into 'important molecules for our health'.

【Key Words】

Lipid machineries: Comprehensive roles of lipids revealed by integrating the knowledge of production, metabolism and reception of lipids.

Lipid mediators: a general term of various bioactive lipids that act as local hormones in our body.

【Homepage Address】

<http://www.lipid.med.kyushu-u.ac.jp/>