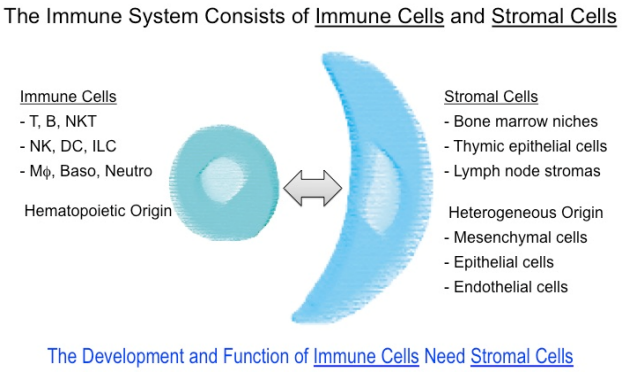
Title of Project : Analysis and synthesis of multidimensional immune organ network

Yousuke Takahama
(University of Tokushima, Institute for Genome Research, Professor)



【Purpose of the Research Project】

The development and function of immune cells depend on the systemic network of specialized microenvironments in immune organs, including the bone marrow, thymus, lymph nodes, and spleen. Although immune cells are of hematopoietic origin, the microenvironments of the immune organs are primarily formed from highly heterogeneous stromal cells of nonhematopoietic origins. Thus, to understand the immune system, it is essential to elucidate how the stromal cells and their network develop and function normally and deviate during aging and in diseases. In this project, we focus on the studies of immune organ microenvironments by multidisciplinary approaches, including synthetic biology, towards the understanding of multidimensional characteristics of stromal cells and their coordinated network.

【Content of the Research Project】

This project consists of three research aspects as follows. In the first aspect of the study, we seek to understand the molecular mechanisms underlying the development and function of the bone marrow niches, thymic microenvironments, and stromal cells in secondary lymphoid organs. In the second aspect, we seek to clarify the dynamic regulation of the immune organ network through structural analysis and intravital imaging of immune molecules and stromal cells. In the third aspect, we seek to understand the deviations of immune organs caused by ageing and diseases and to reconstruct immune functions through synthetic approaches.

【Expected Research Achievements and Scientific Significance】

This study is expected to contribute to comprehensive understanding of the multidimensional nature of the dynamic immune system, functional interfaces of the immune system with the endocrine and nervous systems, and the nature of the “context” detected in various biological systems. Advances in the understanding of immune deviations and reconstruction of immune organ functions should be useful for devising novel approaches to the treatment and management of various intractable diseases.

【Key Words】 immune organ, stromal cell, microenvironment, systemic organ network, immune synthesis

【Term of Project】 FY2012-FY2016

【Budget Allocation】 1,129,400 thousand yen

【Homepage Address and Other Contact Information】

http://immuneorgannetwork.org
takahama@genome.tokushima-u.ac.jp