



Immunology **F**rontier **R**esearch **C**enter



World **P**remier **I**nternational Research Center Initiative

What is WPI?



The **W**orld **P**remier **I**nternational Research Center Initiative (WPI) was established by Japanese Ministry of Education, Culture, Sports, Science and Technology in 2007.

A WPI center is expected to :

- Realize a superb research level and outstanding research environment ;
- Establish hubs that attract world's finest brains and generate excellent research results ;
- Generate seeds of innovation by advancing and integrating cutting-edge researches in different fields.

WPI Research Centers



ITbM, Nagoya U **new!**

iCeMS, Kyoto U

IFReC, Osaka U

I²CNER, Kyushu U

AIMR, Tohoku U

MANA, NIMS

IIIS, U of Tsukuba **new!**

Kavli IPMU, U of Tokyo

ELSI, Tokyo Tech **new!**



M. Kotani
AIMR Director



H. Murayama
Kavli IPMU Director



S. Kitagawa
iCeMS Director



S. Akira
IFReC Director



M. Aono
MANA Director



P. Sofronis
I²CNER Director



M. Yanagisawa
IIIS Director



K. Hirose
ELSI Director



K. Itami
ITbM Director

Materials

Universe

Cells & Materials

Immunology

Nanotechnology

Energy

Sleep

Earth-Life

Bio-Molecules



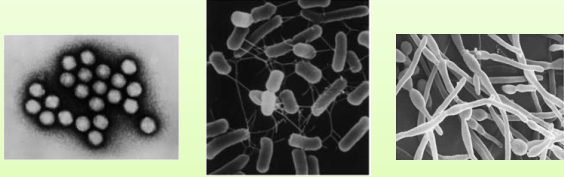
文部科学省

Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan

www.jsps.go.jp/wpi

Immunology?

Infection



Pathogens (bacteria, virus *etc.*)

The immune system protects the body from potentially harmful substances.

Immunology is a broad branch of biomedical science that covers the study of all aspects of the immune system.

Work Well



Elimination of Pathogens

A macrophage is eating bacteria.

Immune System

Work Poorly

Cancer



Infectious Diseases



Sepsis

Autoimmune Diseases



SLE



Rheumatism

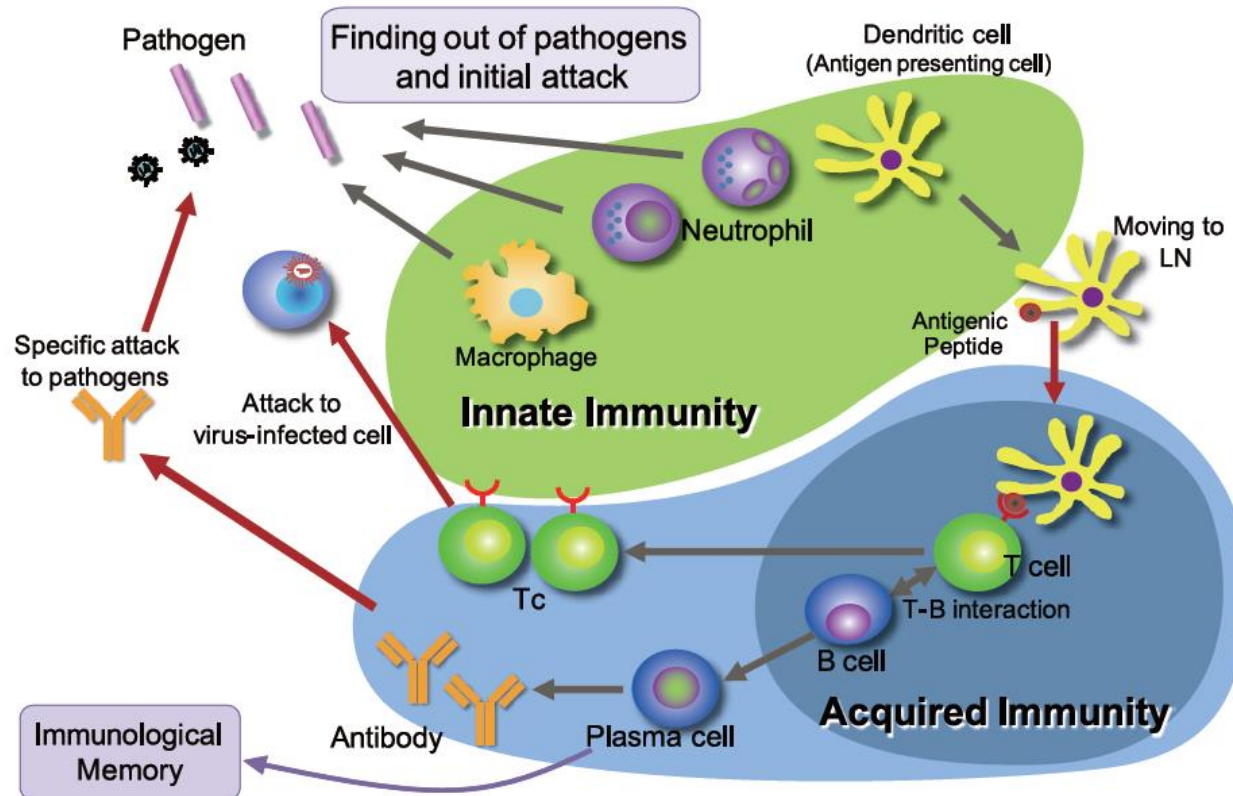
Allergy



Transplantation Rejection



Innate Immunity & Acquired Immunity



- ◆ The innate immune system is a first line of host defense against infection. The acquired immune system is composed of highly specialized immune cells called lymphocytes (T cell or B cell).
- ◆ These two systems are working together to combat various pathogens.

IFReC Inherits Osaka University's Traditions



Koan OGATA (1810-63) was an educator as well as a medical doctor. He established **Jotohkan**, the biggest hospital for smallpox vaccination in Japan. He also opened a public medical school, **Tekijuku**, which evolved into today's Osaka University.

- 1838 Establishment of Tekijuku
- 1880 Establishment of Osaka Prefecture Medical School & the Hospital

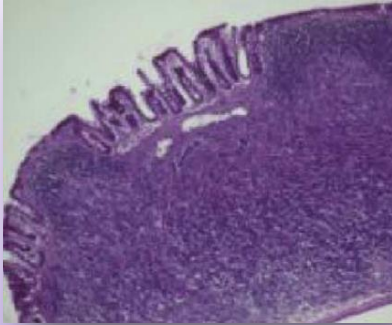
TOP Institution in Immunology 2003-2013

RANK	INSTITUTION	ARTICLES	CITATIONS	CITATION IMPACT
1	OSAKA UNIV, Japan	1,005	56,048	55.77
2	YALE UNIV, USA	1,352	57,783	42.74
3	BRIGHAM & WOMENS HOSP, USA	874	35,303	40.39
4	WASHINGTON UNIV, USA	1,101	41,609	37.79
5	UNIV WASHINGTON, USA	1,726	65,067	37.70
6	National Institute of Allergy and Infectious Diseases, USA	2,280	80,335	35.23
7	STANFORD UNIV, USA	1,013	34,988	34.54
7	UNIV OXFORD, UK	1,465	50,605	34.54

DATA by Essential Science Indicators for 2003-2013 by © THOMSON REUTERS

Osaka University was ranked **1st** in the citation impact among the top institutions in immunology all over the world.

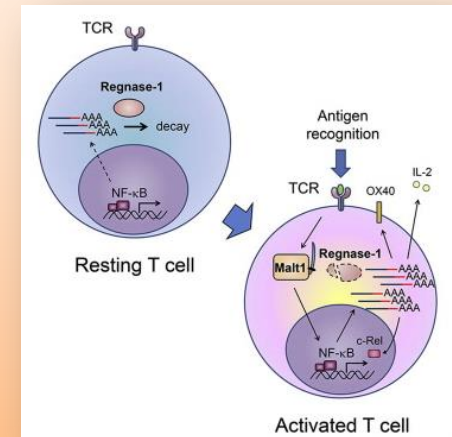
Our Research Outputs



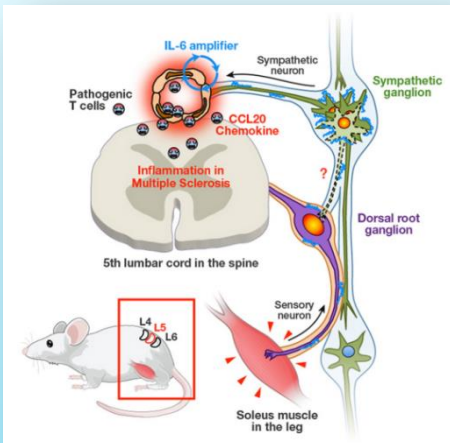
Haematoxylin and eosin staining of CP

Caecal patch is a major site for generation of IgA-secreting cells that migrate to the large intestine. <Kazunori Masahata *et al. Nat Commun.*, 2014>

Dynamic control of Regnase-1 expression in T cells is critical for controlling T cell activation. <Takuya Uehata *et al. Cell* 153:10363-49, 2013>

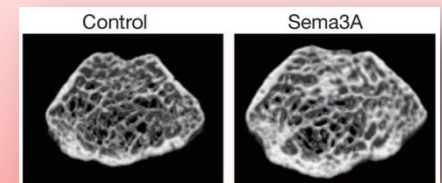


Regional Neural Activation Defines a Gateway for Autoreactive T Cells to Cross the Blood-Brain Barrier. <Yasunobu Arima *et al. Cell* 148:447-457, 2012>



Semaphorin 3A exerts an osteoprotective effect by both suppressing osteoclastic bone resorption and increasing osteoblastic bone formation.

<M. Hayashi *et al. Nature* 485:69-74, 2012>



Director's Message



There are many people all over the world who are suffering from diseases related to the immune system, such as infectious diseases, allergies, and rheumatoid arthritis. In order to overcome these diseases, it is vital to develop new vaccines and therapeutic medications, as well as diagnostic equipment.

Employing a wide variety of approaches, the researchers at IFReC are engaged in fundamental research aimed at surmounting these diseases. We have incorporated bioimaging and bioinformatics in our research, and through studies of the entire bodies of living organisms, we intend to elucidate the details of the dynamics of the immune system.

These approaches are expected to be the first step in controlling immune responses. Furthermore, it will lead to vaccine development and establish new immunotherapy treatments for the diseases listed above.

I would like to ask all of you to keep an eye on the activities of IFReC and WPI institutes in Japan.

Shizuo AKIRA, MD/PhD

Director of IFReC, Distinguished Professor of Osaka University. AKIRA made ground-breaking discoveries in the area of innate host defense mechanisms. He discovered that a variety of Toll-like Receptors recognizes specific microbes, where we previously thought that the innate immune system attacks microbes in a non-specific manner. He has been recognized, in the years 2006 and 2007, as having published the greatest number of 'Hot Papers' over the preceding two years. He is the recipient of Robert Koch Prize (2004), William B. Coley Award (2006), and the Gairdner International Award (2011). He was elected as the foreign associate of National Academy of Sciences in 2009.

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