

Application for Academy Center Certification World Premier International Research Center Initiative (WPI)

Host Institution	Osaka University
Research Center	Immunology Frontier Research Center (IFReC)
Host Institution Head	Shojiro Nishio
Center Director	Shizuo Akira
Administrative Director	Nobuo Sakaguchi

1. Overall Image of Your Center

IFReC was established as a WPI center in 2007 on the basis of Japan-leading research achievements in immunology. IFReC has devoted itself to its mission of combining the fields of immunology, imaging and informatics to comprehensively understand the dynamics of the immune system. During this time, IFReC has built up research achievements of the highest standard producing over 1,300 papers that reached an average citation index of 43.5 and an h-index of 97. In addition, IFReC researchers have had several new discoveries of elements in the immune system and cell signaling pathways as well as creation of innovative new technologies and intellectual property. These advances have attracted much attention from overseas and IFReC has achieved very high visibility internationally in the fields of immunology and biology. The WPI-IFReC center attracts strong interest not only from researchers in Japan and overseas but also international pharmaceutical companies. The WPI program committee also acclaimed IFReC as having achieved World Premier Status. In the next 10 years, IFReC will further raise the standard of its world top-level basic research as a WPI Academy center and will apply the basic research results achieved in order to contribute back to society.

In April 2017, IFReC entered 10 year comprehensive collaboration agreements with Chugai Pharmaceutical Co., Ltd. and Otsuka Pharmaceutical Co., Ltd., respectively. These collaboration agreements secure IFReC researchers the ability to freely advance scientific basic research and by reporting the results gained from the research, create a seamless path to joint research. The collaborations also ensure an operating base for IFReC that replaces that of the WPI grant. IFReC has raised the flag of Open Innovation and hopes to form collaborations with other corporations. This comprehensive collaboration agreement is a new form of university-industry cooperation and has received high acclaim from many quarters. Effective implementation and operation of the Open Innovation strategy is a new mission for IFReC.

2. Research Activities

IFReC has created a unique and energetic research environment with world top-class researchers, a fully-equipped facility and an effective research support system. As a member of the WPI Academy, IFReC will continue to raise its visibility overseas and international confidence in scientific standards in Japan.

(1) Collaboration with QBiC, CiNet and Institute for Datability Science: Researchers at IFReC and these other institutes, also located on Suita Campus, are creating new interdisciplinary research fields to model the immune system as a whole by observing the collective behavior of immune molecules and cells using cutting-edge imaging methods and analyzing the experimentally obtained big data.

(2) Generation of innovative immunotherapies: At IFReC, the application of research outcomes to medical/clinical immunology has been accelerated through cooperation with Osaka University Hospital. In

addition, collaboration with companies is advancing the application of basic research results into drug discovery and development of diagnostic technologies. Listed below are major projects at IFRcC;

- Development of innovative immune-regulating techniques using innate immune mechanisms
- Development of innovative cancer immunotherapy to target regulatory T cells
- Development of novel diagnostic and therapeutic strategies for autoimmune diseases
- Promotion of new drug development with innovative PET/MR and PET/CT imaging
- Forefront vaccine development

3. System for Managing the Research Organization

Research organization and management will be conducted as follows to carry out the research strategy and plan described above.

(1) Maintenance of the WPI research system and operating structure: The current research organization and operation structure will be maintained to the extent possible to fully utilize the advantages. Namely, 1, Top-down decision making by the Director; 2, Use of generous discretionary expenses; 3, The function of the administrative director; 4, Research Planning and Management Office (RPMO) with research administrators (URA) familiar with the needs of researchers; and 5, Administrative staff capable in English.

(2) PI organization with strong potential: Four concurrent PIs (Okada, Yamashita, Nagasawa and Yamasaki) have been appointed in FY2017 to encourage the seamless development of basic research to medical/clinical immunology and to promote interdisciplinary research further. In addition, it is also vital to maintain a high research standard across generations. At IFRcC, if researchers are able to continue to achieve outstanding research outcomes and publish papers in top international journals as well as acquiring external funding of 100 million yen per year, they will be provided with a research environment. IFRcC actively promotes young researchers to PI's in order to steadily inherit research assets from the senior researchers.

(3) Promotion of Open-Innovation strategy toward medical and clinical immunology development IFRcC has formed comprehensive collaboration agreements with multiple companies. Since basic research achievements at IFRcC are reviewed by the companies at an early stage, the agreements are expected to promote joint research for applied research. The Open Innovation Strategy that encourages collaborations with the other companies will advance medical/clinical immunology as well as promotion of basic research and stabilization of the operations base for IFRcC.

(4) Enhanced function as a hub for international brain circulation

(See 4. International Circulation of Best Brains)

(5) Enrichment of the research support system IFRcC has significantly extended the experience of URAs in the WPI program period. Under the comprehensive collaboration agreements, URAs will gain experience in a different realm. Responsibilities will include; support for collaboration with companies such as intellectual property and support for advancing translational research; requiring the training and appointment of professionals with a wider range of capabilities to enrich the research support system.

4. International Circulation of Best Brains

Function as an international brain circulation hub will be enhanced by establishing a virtuous cycle, in which career development of IFRcC's young researchers attracts outside researchers to IFRcC and assists the employment of excellent researchers. To establish this virtuous cycle the following will be implemented.

(1) International brain circulation program for young researchers Under the WPI program IFRcC has already supported nearly 100 young researchers on dispatch overseas as well as supporting visits by international researchers to visit IFRcC using the Kishimoto Foundation Fellowship. As a WPI Academy Center, IFRcC will launch the International Brain Circulation Program for Young Researchers to encourage a continuous flow of international brains by sharing acquired experiences through international exchange among young researchers in IFRcC. It is expected to give strong stimulation to research activities through overseas experience by Japanese researchers and overseas researchers visiting Japan.

(2) Super-postdoc system The acquisition of excellent young researchers is a competition on a global scale. The low level of remuneration in Japan is a significant barrier to hiring international young researchers from overseas. For this reason, the Super-Postdoc system will offer remuneration that is 1.3 times that of standard pay.

(3) Establishment and use of Winter School Alumni The Winter School has been hosted by IFRc and the Singapore Immunology Network since 2012. The young researchers gathered at this school are without doubt the future global leaders of immunology. As a host, IFRc will establish an Alumni to follow the participants' careers, invite them to IFRc events, and maintain and develop the relationships.

(4) Use and fostering of staff to support the international brain circulation The development of the international brain circulation depends on sufficient publicity of research results of young IFRc researchers, and wide publicity of IFRc's research activities to attract excellent young researchers. Effective measures include outreach activities and continuous holding of opportunities to form personnel networks such as international symposia and the Winter School as well as hiring and training URAs capable of supporting such activities.

5. Support by Host institution

(1) Establishment of International Advanced Research Institute Osaka University has set up the International Advanced Research Institute with the university president at its head. IFRc became a permanent core center within the institute.

(2) Assignment of permanent positions for researchers and staff Osaka University has provided IFRc with seven administrative staff, and in FY2015, provided tenure positions for overseas researchers (one professor and two associate professors). Further, the university offers five further tenure positions (including two professors) for three laboratories.

(3) Support for University-Industry Collaboration This fiscal year sees the launch of the comprehensive collaboration agreements and IFRc will promote collaboration with further companies according to the Open Innovation strategy. The support of the Office for Industry-University Co-Creation of Osaka University is vital to handling intellectual property and managing these agreements and other collaborations with companies.

6. Financial Measures

Ensuring IFRc operating costs through collaboration with industry IFRc has concluded two 10 year comprehensive collaboration agreements beginning with Chugai and Otsuka. These agreements mean that operating expenses equivalent to the WPI grant have been secured. Naturally, the accounting management of these external funds must be done with great care. Expenses for university education and training, wider contribution to society and promotion of globalization of the university must be meticulously managed. In particular, support other than salary to researchers is also vital in order to complete the mission of a Hub for International Brain Circulation. Expenses and personnel related to support for publicity of research achievements such as conducting outreach activities and hosting symposia etc. are necessary. Therefore, financial support from Osaka University and MEXT is vital for IFRc to carry out the WPI missions and contribute to the development of medical/clinical immunology as a world leading WPI Academy Center.

World Premier International Research Center Initiative (WPI) List of Principal Investigators

- If the number of principal investigators exceeds 10, add columns as appropriate.
- Place an asterisk (*) by the name of the investigators who are considered to be ranked among the world's top researchers.
- Give age as of 1 April 2017
- For investigators who cannot participate in the center project when its application, indicate the time that their participation will start in the "Notes" column.

Name	Age	Current affiliation (organization, department)	Academic degree and current specialties	(Notes) Enter "new" or "ongoing"
1. Shizuo Akira*	64	Director and Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	Ongoing
2. Tomohiro Kurosaki*	61	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology and molecular biology)	Ongoing
3. Hisashi Arase*	51	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	Ongoing
4. Atsushi Kumanogoh*	50	Professor, Graduate School of Medicine, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	Ongoing
5. Kiyoshi Takeda*	50	Professor, Graduate School of Medicine and Deputy Director, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	Ongoing
6. Ken Ishii*	48	Director, Center for Vaccine and Adjuvant Research(CVAR), National Institute of Biomedical Innovation, Health and Nutrition (NBIOHN), Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology, Vaccine Science)	Ongoing
7. Cevayir Coban	44	Professor, WPI Immunology Frontier Research Center, Osaka University	MD (Clinical Microbiology)	Ongoing
8. Kazuhiro Suzuki	41	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immune cell dynamics)	Ongoing

9. Masahiro Yamamoto	38	Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center, Osaka University	PhD (Immunology)	Ongoing
10. Seymour Benjamin John	44	NICT Invited Executive Researcher and Wellcome Trust Intermediate Clinical Fellow (Cambridge University), Guest Professor WPI Immunology Frontier Research Center, Osaka University	PhD (Neurological Science)	Ongoing
11. Jun Hatazawa*	63	Professor, Graduate School of Medicine, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Nuclear Medicine)	Ongoing
12. Kazuya Kikuchi	51	Professor, Graduate School of Engineering, WPI Immunology Frontier Research Center, Osaka University	PhD (Chemical Biology)	Ongoing
13. Masaru Ishii	43	Professor, Graduate School of Frontier Biosciences, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Bioimaging)	Ongoing
14. Nicholas Isaac Smith	42	Associate Professor, WPI Immunology Frontier Research Center, Osaka University	PhD (Engineering / Applied Physics)	Ongoing
15. Daron M. Standley	49	Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center, Osaka University	PhD (Bioinformatics)	Ongoing
16. Shigekazu Nagata*	67	Professor, WPI Immunology Frontier Research Center, Osaka University	PhD (Molecular/Cell Biology)	Ongoing
17. Taroh Kinoshita*	65	Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center, Osaka University	PhD (Immunology, Biochemistry)	Ongoing
18. Shimon Sakaguchi*	66	Professor, and Deputy Director, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	Ongoing

19. Takashi Saito*	66	Group Director, RIKEN, Research Center for Integrative Medical Sciences Guest Professor, WPI Immunology Frontier Research Center, Osaka University	PhD (Immunology)	Ongoing
20. Hitoshi Kikutani*	66	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	Ongoing
21. Tadimitsu Kishimoto*	77	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	Ongoing
22. Fritz Melchers*	80	Max Planck Fellow Visiting Professor, WPI Immunology Frontier Research Center, Osaka University	PhD (Immunology)	Ongoing
23. Toshio Yanagida*	70	Professor, Graduate School of Frontier Biosciences, WPI Immunology Frontier Research Center, Osaka University	PhD (Molecular Imaging)	Ongoing
24. Yukinori Okada	36	Professor, Graduate School of Medicine, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Bioinformatics)	New
25. Toshihide Yamashita	52	Professor, Graduate School of Medicine, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Neurological Science)	New
26. Takashi Nagasawa	56	Professor, Graduate School of Frontier Biosciences, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	New
27. Sho Yamasakai	48	Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center, Osaka University	PhD (Immunology)	New

World Premier International Research Center Initiative (WPI)
The number of Center personnel

	FY2017
Principal Investigators	27
Other Researchers	115
Post-Doctor researchers	15
Research Support Staffs	49
Administrative Staffs	25

World Premier International Research Center Initiative (WPI) Diagram of management system

