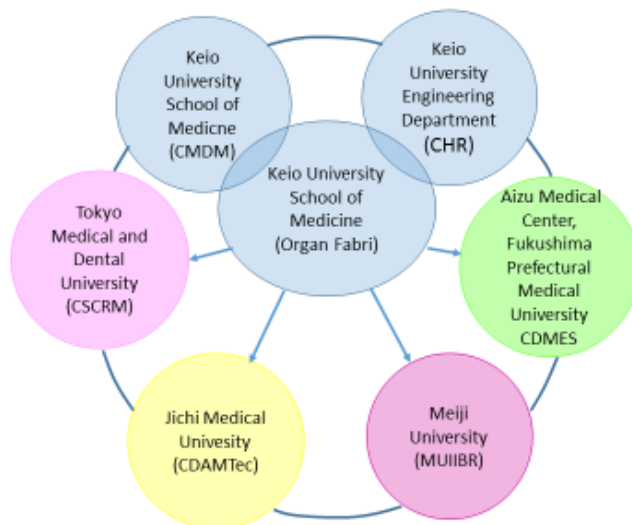


The Concept of Center-in-Center to Bridge Vast Research Fields



1. Center for Development of Advanced Medical Technology, Jichi Medical University

In 2001 Prof. Kobayashi as a Chief Researcher applied for Tochigi Prefectural Project for Advancing Important Research Development (Medical Field) and won the prefectural support for “The Establishment of Medical Training System”. The project is to push forward medical researches through the maximum usage of experimental pigs instead of lost dogs transferred from local health centers, which had been totally abolished. In 2003 Prof. Kobayashi was also assigned to a Director of Center for Experimental Medicine, Jichi Medical University, the project of Pig Center was launched systematically. After the launch, it has been developed thanks to the governmental grants and co-research funding. The center inaugurated in 2009 as Center for Development of Advanced Medical Technology (CDAMTec) has been focusing on the supports for research development, medical training and research in the field of advanced medical technology by using experimental mini pigs. There is a surgical operation facility dedicated to experimental animals and it enables to manage and provide experimental animal datum from acute phase through chronic stage, which is one of the most advanced facilities in Japan.

(For more details, please have a look at <http://www.jichi.ac.jp/cdamt/otoiwase/faq.html>)

2. International Institute for Bio-Resource Research, Meiji University

Prof. Hiroshi Nagashima manages Meiji University International Institute for Bio-Resource Research (MUIIBR), which acts as a cluster to create, maintain and optimize bio-resources to contribute to the advancement of translational research bridging the knowledge and technique acquired from plastic surgery, organ transplant (xenogeneic transplant), organ regeneration and

reproductive technique nurtured as basic researches. The center has the aim to acquire highly practical and unique research results through the optimization of experimental pigs which are closer to human being physiologically and anatomically as a research platform. Prof. Kobayashi from the inauguration of the center has been in charge of organ regeneration and transplantation fields as an important extramural co-research partner.

(For more details, please have a look at <http://muiibr.com/english/index.html>)

3. Center for Stem Cell and Regenerative Medicine, Tokyo Medical and Dental University

The center (CSCRM) has been inaugurated based on the excellent research results in regard to regenerative medicine. Prof. Ichiro Sekiya as a director of the center has been achieving eminent research results on the regeneration of meniscus cartilage as rat models and pig models as preclinical researches by inviting Prof. Kobayashi as a visiting professor. Based on the research results, the center acts as a core to cure patients.

(For more details, please have a look at <http://www.tmd.ac.jp/med/arm/>)

4. Center for Medical Training System Development in Aizu Medical Center, Fukushima Prefectural Medical University

Aizu Medical Center was inaugurated in May 2013 as a new facility of Fukushima Prefectural Medical University for the purpose of supporting hands-on training of medical students as well as acting as a training core for early and later-stage residents. Prof. Takuro Saito of surgical medicine has been advancing academia-academia co-researches with Prof. Kobayashi, Keio University School of Medicine and establishing academia-industry co-research relationship with local companies to have resulted in opening the Center in May 2015 for the purpose of developing new medical training system. Currently the new training protocols will be pushed forward maximizing the Center as a core for converting tissues and organs of sanctified pigs to training materials for students and residents.

(Website under construction)

5. The Haptics Research Center, Keio University Faculty of Science and Technology

Center for Haptics Research was inaugurated in December 2014 in line with Advance Technology Center (ATC) Keio University Faculty of Science and Technology with Prof. Kouhei Onishi as a director of the center. ATC was established within Keio University as a research core under totally new concept by combining and merging various scopes of research fields in order to activate and accelerate researches cross-departments and cross-graduate schools overall organization through optimizing ATC's establishment, renewal, management and personnel activities.

Prof. Kobayashi has been pushing forward co-researches with Prof. Onishi the application of haptics technology to medical treatment, especially to microsurgical fields.

(For further details, please have a look at

<http://www.ceatec.com/en/exhibitors/detail.html?id=5472>)

6. Center for Molecular Hydrogen Medicine, Keio University School of Medicine

Also in line with ATC concept, the new Center-in-center is to be inaugurated in October 2015. The director of the center will be Dr. Motoaki Sano M.D., Ph.D. (Associate Professor, Department of cardiovascular medicine). The team of Dr. Sano has been playing an important role to realize hydrogen treatment to cure patients in various stages of critical care medical settings. Prof. Kobayashi has been strengthening cross-border academia-academia collaboration and at the same time based on the academia-industry co-researches, advancing non-clinical-clinical integrated researches on the development of Hydrogen-gas-related medical devices for pharmaceutical approval as a co-researcher.

(For further details, please have a look at

the next page below)

The center for molecular hydrogen medicine

Director: Dr. Motoaki Sano (Associate Professor, School of Medicine)
Head Office: Keio University School of Medicine, Shinamonachi Campus

The concept

The optimization of hydrogen as a source of energy has been highlighted to solve the trilemma; Economy, Energy and Environment. We have been playing advanced and strategic roles as a center of researches to realize hydrogen treatment to cure patients in various stages of critical care medical settings. Hereto, we have inaugurated the center for molecular hydrogen medicine through strengthening cross-border academia-academia collaboration and at the same time based on the academia-industry co-researches, advancing non-clinical-clinical integrated researches on the development of Hydrogen-gas-related medical devices for pharmaceutical approval.

Keywords/Major research themes

Hydrogen medicine, Non-clinical-clinical integrated research, Academia-academia collaboration

2015 Research Plan

(1) Pioneering pre-clinical research

We push forward pre-clinical researches not only for the usage of experimental animals as a science but for clinical development as a definite goal.

- In case of small animal experiments, we develop highly reproducible precise disease animal models through the introduction of microsurgical technique directed by Prof. Eiji Kobayashi. In order to build up a series of systems to manage animals and evaluate pharmacology for hydrogen inhalation, we set up academia-academia consortium with veterinary college and improve laboratories so that we can operate and manage experimental animals systematically.
- In regard to big-size experimental animals, we develop safety evaluation tests for medical equipment through the maximum usage of experimental pigs.

(2) The development of medical devices

We develop medical equipment and device such as hydrogen generator, mixed device for hydrogen gas inhalation, etc. Optimizing the advantages as a university of Keio, we strengthen cross-faculty collaboration with the faculty of Science and Technology and so on.

(3) Clinical research

We develop multi-facility randomized comparison tests in order to evaluate the efficacy of hydrogen inhalation treatment method toward patient resuscitated from cardiac arrest outside the hospital by way of academia-industry collaboration which would be viable through strengthening collaboration between academic societies and medical institutions.