

Creating new industries for next-generation medical equipment using optical technologies like high-brightness white LEDs

Overview

This project is conducting R&D on advanced medical devices/equipment designed to meet needs in a variety of medical fields, where there is high demand for "people-friendly" prevention, diagnosis, and treatment. The R&D employs optical technologies like the high-brightness light emitting diodes (LEDs) developed independently at Yamaguchi University. The project involves active participation by local companies, companies outside the region, universities and other research institutions, as well as close collaboration with the medical engineering field. In this way, we are promoting development and commercialization of minimally invasive medical equipment and highly functional diagnostic devices. Our goal is to form a technology innovation cluster to support development of a next-generation medical equipment industry and create employment opportunities.

Cluster Headquarters

- **President** Hiroshi Kato (President, Yamaguchi University)
- **Project Director** Tokio Ooshima
- **Chief Scientist (CS)** Tsunemasa Taguchi (Professor, Yamaguchi University)
- **Deputy Chief Scientist (CS)** Masaaki Oka (Professor, Yamaguchi University)
- **Science and Technology Coordinators** Shin-ichiro Uchiyama, Shiroh Murano, addition of 1 more person is planned

Core Organization

Yamaguchi Industrial Promotion Foundation

Participating Research Organizations

(Bold: Core Research Organization)

Industry···ALMOULD CO.,LTD., ALOKA CO.,LTD., UBE INDUSTRIES,LTD.,
 NTT Advanced Technology Corporation, Ecomas Co.,Ltd., M-TEC Co.,Ltd., Sanjo Seiki Co.,Ltd.,
 Sanyo Hightec Co.,Ltd., Choshu Industry Co.,Ltd., Toyobo.co.,Ltd, BIOPHENIX CO.,LTD.,
 Hitachi Software Engineering Co.,Ltd.,Fuji Electric Ind.Co.,Ltd., FUJI PHOTO OPTICAL CO.,LTD.,
 PENTAX Corporation, Matsushita Electric Works,Ltd., Mitsubishi Cable Industries,Ltd.,
 YUKI ENGINEERING CO.,LTD, Yoshim electronics Co.,Ltd., Yokogawa Electric Corporation,
 Wako Pure Chemical Industries,Ltd.

Academia···**School of Medicine, Faculty of Engineering**, School of Science, Applied Medical Engineering Science
 faculty in the Graduate School of Medicine, Organization for Education, **Yamaguchi University**;
 School of Pharmaceutical Sciences, Kyushu University; Graduate School of Engineering, Nagoya University

Government···National Institute of Advanced Industrial Science and Technology (AIST, an Independent
 Administrative Institution)



Project Director
Tokio Ooshima

Aiming to Create a Cluster in the Advanced Medical Equipment Industry. Knowledge Cluster Initiative Will Play the Role of Pump Primer.

Since Ube was selected in 2002 as a pilot area for creation of a knowledge cluster, we have seen progress in the development of minimally invasive medical devices through cooperation with the medical engineering field. This development has been based on the high-brightness white LED developed at Yamaguchi University.

More specifically, this white LED (which has a hue close to that of the sun) has been used as a light source in developing endoscopes and other optical based medical equipment. A prototype white LED endoscope has been used to examine a dog's stomach, and the inner stomach lining could be observed in its natural state. In this and in other ways, we have confirmed the superior color reproduction (hue) characteristics of the white LED. We have also developed an apparatus for evaluating the dynamical characteristics of stents (metal-made devices placed within blood vessels to improve blood flow), and this apparatus has served as the basis for a university-incubated venture startup.

In order to pursue R&D and commercialization of next-generation medical devices and equipment, it is essential that we have the most advanced technologies. We must also obtain the required approvals under the Pharmaceutica Affairs Law and other regulations. We will move forward in the present project, in order for private companies to effectively utilize their experiences gained in previous medical and pharmaceutical business launches, and so that universities, large companies, and local companies can work closely in the smooth pursuit of related business.

It is our hope that, through the successful results of Knowledge Cluster Initiative, we will create an advanced medical equipment industry, and that we can thereby contribute the vitalization of our country's medical equipment industry, an industry where there is currently excessive imports.

We will unite the energy of all related persons participating in this project, and, while also linking up with other, industrial-type cluster plans, strive for the creation of a technological innovation-type medical equipment development cluster within the Ube area.

Tokio Ooshima is a former group leader of the Medical & Bio Research Division and director of the Medical Development Division at Ube Industries, Ltd. He is also a former president of Medical System Service (Chiba) Co., Ltd.

Outline of the Joint Research by Industry, Academia and Government

Here, the faculties of medicine and engineering at Yamaguchi University serve as the core research institutions, and to these are added other academic institutions, including Kyushu University and Nagoya University, and public institutions including the National Institute of Advanced Industrial Science and Technology (AIST); while from industry, participating are small, medium and large-sized companies as well as major companies involved in related fields while located outside of the region.

Through the mutual working of all of these participants, progress is being made on the development and product creation of high-brightness white light-emitting diode (LED) manufacturing technologies, minimally invasive medical devices and equipment using high-brightness white LEDs, and of advanced diagnostic and inspection equipment, etc.

- The establishment of high-brightness white LED manufacturing technologies under development at Yamaguchi University, and the development of hospital interior lighting as well as disinfectant and deodorant equipment, etc., all using high-brightness LEDs.
- The development of high-brightness LED-using medical devices such as endoscopes and optical treatment devices that reduce the burden on patients (i.e., minimally invasive medical devices), and the development of [related] advanced medical equipment.
- The development of apparatus that can investigate the composition and properties of blood vessel walls, and accurately diagnose atherosclerosis with a single catheter which has both ultrasound and near infrared tips.
- The development of mobile-type measurement apparatus that enables the diagnosis of vascular diseases such as cerebral infarction and angina pectoris via the measurement of contents of sphingosylphosphorylcholine (SPC: a type of phospholipid existing in organisms, and a material that causes abnormal constriction of arteries).
- The development of high capability, small-sized, low-cost cell information analysis systems using semiconductor quantum dots (semiconductor microparticles that emit fluorescent light when excited by ultraviolet rays), and immunity diagnostic devices (which use antigen-antibody reactions).

