

TMDU's research vision: To strengthen the core and support the evolution of medical and dental research while aiming toward the future

At Tokyo Medical and Dental University (TMDU), the medical and dental departments have been trendsetters in research and education. TMDU also embraces two research-specific labs: the Medical Research Institute, which pursues the etiopathology of intractable diseases, including cancer, and the Institute of Biomaterials and Bio-engineering, which develops materials and devices for treating patients.

Our Medical Hospital boasts the highest percentage in Japan of matching applicants with their desired clinical training. Moreover, many of our faculty members there are involved in the clinical care of patients and are conducting basic research to address clinical problems—a system not widely seen in many other countries. The Dental Hospital has the largest number of patients in Japan, which plays a vital role in revealing important areas for medical and dental research—

for example, the relationship between oral bacteria and dementia.

One of TMDU's highlights is preemptive medicine, in which our extensive data collected from patient samples of breath, sweat and tears can be used to evaluate a patient's condition. Precision medicine, which uses genome information, is another field of interest, as it promises to uncover the most suitable therapy for an individual patient.

In 2018, we established the "Organ and Tissue Neogenesis Consortium" by integrating solid research activities from various areas involved in regenerative medicine, where TMDU's strengths lie (see TMDU Research NEWS, pp. 6-7). Moreover, we launched a new training program for outstanding young researchers, called "Cultivating Unit for Innovating Medical Scientist," in which our researchers will work in untapped fields under the guidance of top-flight scien-

tists invited from around the world.

Along with these innovative research opportunities, TMDU continues to ensure intensive lessons and interactions for students, thanks to our high faculty-to-student ratio, which allows faculty members to conduct their own research while also training the next generation of researchers. The TMDU campus is also open to foreign students; in fact, about 19 percent of our graduate students come from abroad, one of the highest percentages at any post-graduate institution in Japan.

TMDU has been building international collaborative partnerships all around the world in both research and education. This booklet highlights the latest scientific research from TMDU. We hope our readers find it fascinating and come away inspired to build collaborative relations with TMDU researchers.

Prominent Researcher

Discovering the breast cancer gene and contributing to diagnosis and treatment



Yoshio Miki
Professor of Molecular
Genetics at TMDU

Prof. Miki discovered BRCA1, the gene that causes Hereditary Breast and Ovarian Cancer (HBOC) syndrome.

After graduating from university, Prof. Miki worked as a surgeon at the Hyogo College of Medicine. In 1989, he moved to the Cancer Institute at Japanese Foundation For Cancer Research (JFCR) and joined an ongoing project to isolate the causative gene behind familial adenomatous polyposis.

Following that project's success, he became a research fellow at the University of Utah, where, in 1994, he succeeded in isolating BRCA1. He returned to JFCR the following year and has been a professor at TMDU since 2002.

Following the isolation of BRCA1, a British group discovered BRCA2 in 1995. Today BRCA1/2 testing is used for pre-symptomatic diagnosis and

definitive diagnosis of HBOC. Since 2018, TMDU Medical Hospital has offered outpatient treatment of HBOC. Prof. Miki's discovery has contributed enormously to the genomic therapy of breast and ovarian cancer.

As researchers around the world sought to elucidate the function of BRCA1/2, it was discovered that BRCA1/2, which normally functions to repair DNA double-strand breaks, causes the onset of HBOC when mutated. Following this discovery, drugs have been developed with the strategy of "synthetic lethality," which involves killing cancer cells by inhibiting another DNA-repair function. This therapy is now starting to be adopted worldwide.

Meanwhile, Prof. Miki continues to promote the elucidation of the function of BRCA1/2 with the aim of advancing diagnosis and treatment of sporadic breast and ovarian cancer. For the future of cancer genome research, he believes it is important to promote cooperation among researchers worldwide so as to share genome databases of various populations and analyze them using artificial intelligence. The differences and universal features that can be found in genomes can help spur understanding and discovery.

Prof. Miki has also been making great efforts to apply his clinical experience to basic research. He believes that it is not possible to discover new things through reasoning alone. For him, intuition plays an important role in understanding situations that cannot be explained by theory. These are the key factors that have enabled Prof. Miki to achieve his research success.