



Interview with Ikuo Morita, Executive Director Medical and Dental Science – serving patients and society

Ikuo Morita

Executive Director /
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Unique and ongoing results in genome and regenerative medicine

— **What are the distinctive characteristics of TMDU research?**

Dr. Morita: Our research is goal oriented, based on both medical and dental science. Of course, considering a thesis is important, however, we are focused more on the benefit for patients, which can come from new medical methods, medicines, and devices.

Unlike other medical and dental science schools, we incorporate two unique institutes, the Medical Research Institute and the Institute of Biomaterials and Bioengineering, where researchers study in collaboration with our Faculty of Medicine and Faculty of Dentistry.

— **Which fields of study are emphasized at TMDU?**

Dr. Morita: First, I would like to highlight the genome research that is conducted mainly at the Medical Research Institute. There, we focus on cancer, developmental anomalies, and cerebropathies, such as Alzheimer's disease. We are practicing personalized medicine and preemptive medicine by analyzing genomes, including epigenomes, and comparing genomic data with clinical data provided by our Medical Hospital. Recent accomplishments include the discovery of a gene causing Scirrhus stomach cancer, and a study based on proteome analysis and system biology, which proved that a phosphorylated protein is seen at the early stages of Alzheimer's disease. Both of these lead to personalized preventive medicine and treatment.

As for preemptive medicine, successful collaborative research with Sony Corp. on the interpretation of genomic information has made us start a new business providing information about the risk of cancer and lifestyle diseases based on genome analysis data—a "Genome and Health Information Service".

Another highlight is regenerative medicine, which is mainly implemented by clinical researchers in the Faculty of Medicine. TMDU stands among the great research institutes in regenerative medicine in Japan, which include the Center for iPS Cell Research and Application at Kyoto University directed by Professor Shinya Yamanaka. TMDU is one of the leading institutes in Eastern Japan. TMDU's main approach is to use autologous stem cells from patients, not iPS Cells. Notably, the treatment of an extruded injured meniscus by transplantation of

synovial stem cells has already been under clinical trial. Also, regeneration of large intestine epithelium cells will be under the trial within one year, offering great hope for the treatment of ulcerative colitis and Crohn's disease, which unfortunately lack effective treatments. Other professors are researching stem cells' quality maintenance and standardization, alongside the above trials.

In addition, researchers are studying the mechanism of the generation of gray hair and hair loss, which could lead to the development of preventive approaches and could be considered a kind of regenerative medicine, even though it does not utilize stem cells.

Dental university pursues collaborative medical and engineering research

— **TMDU was established as Tokyo National School of Dentistry in 1928, and the Faculty of Medicine was launched later. Is the tradition of the dental university affecting current research activities?**

Dr. Morita: Of course. The Faculty of Dentistry has developed the materials for regeneration and repair of teeth with the collaboration of the Institute of Biomaterials and Bioengineering and medical companies. These materials include dental adhesive and titanium alloy wires for braces that are currently used for dental treatments. They also have developed a technique for sintering a powder of hydroxyapatite—a major component of bones and teeth—and making artificial bones and teeth roots for practical use.

Even in the Faculty of Medicine, basic research on bones and other hard tissues such as teeth is broadly conducted and many related medical departments exist, including Orthopaedic Surgery.

The combination of the traditions of dental science and regenerative medicine has started bringing great results. One of them is a technique for regeneration of alveolar bone. Alveolar bones can disappear due to periodontal disease, and this might complicate dental implants. With this new technique, however, cultured mesenchymal stem cells from a pulled tooth can be transformed into a membrane and applied to the remaining alveolar bones so that they regenerate. The culturing substrate has been developed in collaboration with Dai Nippon Printing Co., Ltd. Trials on rats have shown the efficacy of this method and efforts are underway to pursue human trials.

— **What kinds of materials are being studied in the Institute of Biomaterials and Bioengineering?**

Dr. Morita: One of the goals of this institute is to develop biocompatible materials, so researchers are utilizing all sorts of materials, such as metals, organic materials and inorganic materials. They are also researching the sensors required to monitor a human body's status, and are developing assisting robots for surgery.

The research that brings engineering techniques to medical study is largely applied, not only in this institute. For example, our Urology team has developed a 3-D Head Mount Display for surgeons in collaboration with Sony Corp. The display device is a modified gaming headset that provides images from an endoscope, which means the surgeon does not need to view images on a standard monitor. This can resolve the operator's usual problem of having to watch both his hands and the monitor simultaneously, and therefore can improve surgery processes. The Head Mount Display went on the market in 2013 and has been approved for sale in Europe and the United States. Currently, this newly developed display is being used in all urology surgeries at TMDU and by other departments and hospitals.

Successful alliances between academia and industry provide models for other universities

— **It is necessary to collaborate with industry in order to market new medical methods, medicine and devices, isn't it?**

Dr. Morita: People may not know, but TMDU is actually highly regarded as a leader in building academic-industrial alliances and as an excellent model of this approach.

In order to develop academic-industrial alliance systems, both defensive and offensive approaches are required: "Defensive" includes, for example, creating regulations concerning bioethics and conflicts-of-interest, while "offensive" includes intellectual property strategy, policy advocacy, and strategies for attracting the attention of industry. TMDU, primarily led by the Research Center for Industry Alliances, proactively provides information to companies, launches new ventures, and holds seminars to educate its own professors about regulations and intellectual property strategy.

We also have established an organization called medU-net (Japanese Association of Medical University Network for Technology Transfer). More than 80 academic institutions, such as medical universities, as well as more than 85 companies seeking information

about research results, have participated in medU-net. MedU-net plays an effective role as a platform between industry and academia and provides the opportunity to share the TMDU-grown system of academia-industry collaboration. Moreover, through medU-net, TMDU itself can initiate relationships with companies.

The above efforts resulted in substantial collaborative research with companies and 788 contracts between industry and TMDU in FY 2014. By overcoming the inherent difficulties, venture companies that produce nucleic acid medicine and robots have been established, and in FY 2015 TMDU's total income from patent licensing and lump-sum payments from new ventures will place it among the highest ranked of all Japanese universities.

— **We have heard about your vigorous activities to provide materials to researchers and companies, both domestic and international. Please tell us more.**

Dr. Morita: TMDU owns a "Mice Key Bank" with more than 100 kinds of experimental mice. Also, many of our researchers own unique antibodies. With material transfer agreements (MTA), this research material is available upon request to outside researchers. In addition, an undocumented MTA is also available to provide material within three days for 28 research institutes from Japan, Europe and the United States, such as Stanford University.

— **TMDU is not only conducting high-level basic research but also making efforts to collaborate with industry so as to achieve results that benefit patients. What is its main direction for the future?**

Dr. Morita: We would like to promote globalization of research with the goal of improving research abilities and creating superior outcomes.

TMDU is the top medical university in Japan in terms of the number of accepted international students. We also have international institutes in Chile, Thailand, and Ghana, and 30 – 40 % of our current students have studied in one of those international institutes, or at Harvard Medical School in Massachusetts or Imperial College London.

Unfortunately, however, international collaborative research efforts are few. So our Research Administration Division is actively promoting the idea by providing our research scientists with information about outside researchers and their study results. I hope this brochure will be a good step in promoting new international relations and a robust network among researchers around the world.



International researcher



From research to clinic: Medical Hospital



From clinic to research: Dental Hospital