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Tokyo Medical and Dental University (TMDU)

LEADING THE WAY IN BASIC AND CLINICAL LIFE SCIENCE RESEARCH AND EDUCATION



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There can be no doubting the pedigree of Tokyo Medical and Dental University (TMDU). Its headquarters is in Ochanomizu, a part of the Japanese capital known for scholarship since the 17th century. It took over from its predecessor, the Tokyo National School of Dentistry, the nation's first institute for dentistry education, in 1946. Since then, it has grown into one of the most influential medical research institutions in the world.

TMDU is ranked eighth in Japan, and in the top 300 worldwide in the *Times Higher Education* (THE) World University Rankings 2013–2014. It scores especially highly on the number of citations per research paper published by its staff. Yet the university has no plans to rest on its laurels.

Its goal is to become one of the top 100 universities in the world within the next 10 years. One way it hopes to achieve this is through greater international links. Personnel exchange agreements have already been completed with 77 universities in 26 countries, and overseas education and research bases have been established in Chile, Ghana, and Thailand. One of every five international medical graduate students in Japan studies at TMDU.

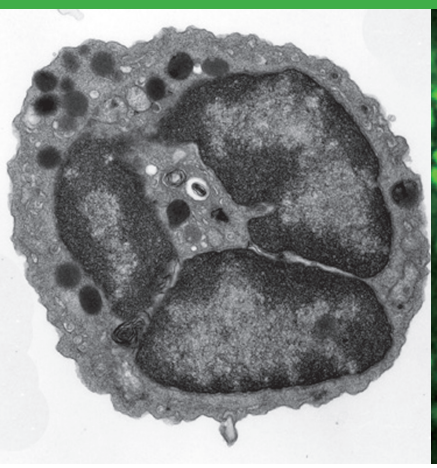
Recent efforts such as these are already bearing fruit. In 2013, TMDU was awarded Research University status under a Japanese Government programme to encourage the country's best research institutions to perform even better. To help it achieve this, the university has developed a five-pillar strategy that involves ensuring the recruitment and development of excellent personnel, fostering an environment in which high-quality research can flourish, reinforcing university governance, promoting cooperation with industrial enterprises and increased use of research administrators.

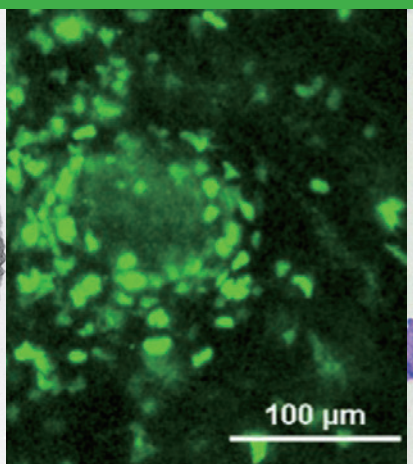
TMDU is also keen to explore new ways of teaching and doing research. Recent pilot projects include a programme that allows graduate students to work under multiple supervisors to broaden their horizons beyond their primary fields, and the development of a joint university graduate school system under which participants' coursework can be completed at any of six research institutions, including four national research centres. Detailed negotiations on the creation of joint degree programmes with the University of Chile and Chulalongkorn University in Thailand are underway. The university also intends to develop a tenure-track system to help attract high calibre international researchers.

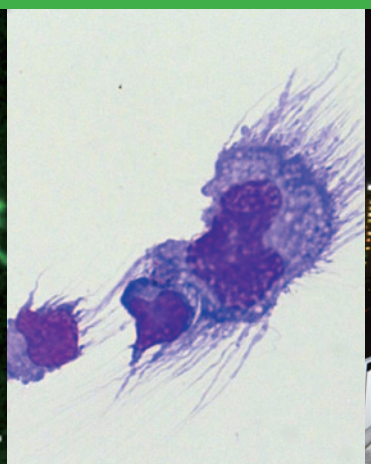
Other recent innovations include the establishment of the TMDU Bioresource Research Centre as a repository for human tissue, serum and DNA samples to facilitate translational research into personalized medicine, and of a bank to house strains of genetically modified mice to support gene-based research. The university is also leading a network designed to increase cooperation between industrial enterprises and medical universities.

Moving forward, TMDU is looking into setting up an animal experimentation institution for medium- to large-sized animals, which would meet the high standards set by the Association for the Assessment and Accreditation of Laboratory Animal Care. Efforts are being made to employ a greater proportion of younger, female and international researchers. Plans are also being made to develop a strategic research organization led by TMDU president Takashi Ohyama, and to increase capital investments.

The university is cooperating with industry in a variety of ways designed to produce outstanding research. It is hoped that the planned establishment of the TMDU Organization for Propulsion of Medical Innovation (OPMI) and increased use of research administrators will play







important roles on this front. TMDU plans both to hire new researchers, including those with experience of working in the pharmaceutical industry, and to place existing researchers with industry, to work on research with clearly defined medical and health-care objectives. It is involved in efforts to draw up regulations to address conflicts of interest and uphold the highest standard of bioethics so as to promote responsible cooperation between industrial enterprises and universities, including in the special context of personalized medicine. It will also promote the education of medical staff trained to make the most of genetics in the diagnosis and treatment of patients.

These initiatives and programmes may help TMDU achieve its ambition of becoming one of the top 100 universities in the world. Ultimately however, this will only be achieved if its staff continues to produce high-quality research of the kind outlined below.

Putting the spotlight on immune system regulation

Most antigens are proteins that occur on the surfaces of viruses, bacteria, fungi or cells. TMDU researchers are investigating the how the immune system learns to respond to non-protein antigens such as carbohydrate chains. They are also looking more broadly at the role of host immunity in diseases and how that relates to the development of effective immunotherapies, as well as working towards a better understanding of intracellular mechanisms underpinning viral replication in the hope of identifying therapeutic molecules. Other promising research areas include elucidating the distinguishing characteristics of immune reactions through analysis at the molecular level, and a focus on oral mucosal dendritic cells.

New tools uncovering the protective roles of basophils

Basophils are white blood cells that can be stained using basic dyes. Their presence in circulating blood was identified more than 120 years ago. Attempts to understand their roles have been hindered by their rarity — they represent less than 1% of peripheral blood leukocytes — and the absence of basophil-deficient animal models.

TMDU researchers have recently developed new ways to investigate the functions of basophils in health and disease. Hajime Karasuyama's laboratory has established a basophil-depleting antibody and engineered basophil-deficient mice. His team has discovered that these cells help protect us from parasitic infections, such as those caused by ticks and helminths, while also contributing to the development of allergic disorders such as atopic dermatitis. This work may lead to the development of anti-parasite vaccines and novel strategies for treating allergies.

A novel source of dendritic cells that could inspire new ways to fight disease

Dendritic cells (DCs) play crucial immune system roles both by helping prevent overreactions under steady-state conditions and by absorbing fragments of antigens to present to the antigen-specific immune system to trigger attacks following infection. Toshiaki Ohteki's group recently discovered a novel source of DCs called DC progenitors. These generate no other haematopoietic cells. Each can produce up to 1,000 fresh DCs. This discovery will provide insights into the DC differentiation pathways, as well as new avenues for the development of therapies for infectious diseases, cancers and autoimmune diseases. ■

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