Central Institute for Experimental Animals (CIEA) at KING SKYFRONT

Real-world applications of 70 years of creative research are contributing to human healthcare worldwide

“My father, Tatsuji Nomura established the Central Institute for Experimental Animals (CIEA) in 1952 with the aim of contributing to medical care and medical science based on high quality animal experiment systems,” says Ryuta Nomura, Chairman of the Board and Chief Executive Officer of CIEA. “His pioneering research laid the foundations for our global reputation as one of the world’s leading institutes focused on the development and commercialization of advanced laboratory animals and germ-free animal technology.”

Indeed, over the last 70 years scientists at CIEA have played pivotal roles in a wide range of international projects including WHO programs on eradicating polio; developing therapeutic solutions for muscular dystrophy; establishing protocols to validate the safety of regenerative and cellular medicine; and development of drugs for cancer and other diseases.

“The CIEA is a private and independent non-profit institute,” explains Nomura. “We must raise funding for our research. We do this by commercializing the results of our research by licensing our technology. This approach is at the heart of our business model. We think that real-world applications of our research are the ultimate way of contributing to the health of human beings all over the world.”

Unique animal model systems created by CIEA

Research at CIEA is conducted at four departments.

- Department of Basic Research for Laboratory Animals

The Immunology Laboratory is developing severely immunodeficient mice such as NOG and next generation NOG mice also referred to as ‘humanized mice’ for drug discovery and safety studies.

- Department of Applied Research for Laboratory Animals

Research in this department covers topics including the development of (1) human disease model mice for studying such allergies, infections, and autoimmune diseases; (2) humanized liver mice for studying diseases such as hepatitis virus and malaria for drug development; and (3) xenograft models for screening of anticancer drugs.

- Department of Marmoset Biology and Medicine

Researchers of the CIEA developed for the first time in the world genetically modified marmoset in 2009 and are now producing immunodeficient marmosets exhibiting symptoms similar to X-linked immunodeficiency for use in studies on genetically modification human diseases models and new therapies and rugs.

Research at the Molecular Embryology Laboratory is focused on the use of genetically modified technology to transfuse “genes that cause Alzheimer's and Parkinson's disease into fertilized eggs of marmosets through viral vectors to generate human disease models in marmosets”.

Notably, scientists at the Reproductive Engineering Laboratory are also developing reproductive engineering

technology, such as micromanipulation instrumentation, for the “creation of new laboratory animals”.

- **Live Animal Imaging Center**

State of the art technology at this center includes MRI, micro X-ray computed tomography (CT) and in vivo fluorescence imaging. This technology is a powerful approach for Replacement, Reduction, and Refinement (“3 Rs”) for laboratory animal science, enabling non-invasive observation of temporal changes in-vivo.

International collaboration and expansion overseas

“Currently, approximately 30% of our royalties are from licenses with overseas partners,” says Nomura. “We are planning to increase this by expanding collaborations with overseas institutes by opening up our facilities and technology on a global scale.”

Specific examples of new areas of expansion include ‘research inbound’ projects, that is, undertaking experiments at the CIEA in Japan that cannot be carried out by partners in their own countries due to changes in regulations or laws; and conducting experiments that can only be done at CIEA such as using its unique MRI and egg fertilization technology.

“We also planning to push ahead with the creation of even more advanced forms of humanized mice models,” explain Nomura. “Examples include multi-organ/multi-tissue mouse models and reproducing human pathology, where there is interaction and feedback between the two areas.”

Specific examples for multi-organ/multi-tissue models are functional human blood immune systems; and human liver human lungs; ES/iPS derived tissues (nerves, liver, intestines, lungs, thymus, lungs). And examples for reproducing human pathology are cancer immunity; enrichment of patient-derived xenograft (PDX) models; autoimmune disease infection; and iPS cells derived from patients with neurodegenerative diseases.

Synchronizing CIEA’s research activities with new trends in medical health and research

“Research at CIEA is continuously evolving to satisfy the needs of modern society,” says Nomura. “For example, we want play a central role in finding solutions to new medical challenges due to the COVID-19 pandemic. For example, creating animal models with marmosets to treat disease such as depression that is associated with side effects of COVID-19.”

Other projects include diversifying CIEA technology, for example, using CIEA’s highly reproducible, semi-automatic 3D system for artificial insemination. “This technology has great potential for tackling declining birthrates,” says Nomura. “The success rate of human-operator based artificial insemination is only between 20 to 60%. Our technology is semi-automatic, thereby reducing human errors during the process of fertilization of eggs. This could be a major contribution to medical health globally.”

Thoughts about KING SKYFRONT at Tonomachi, Kawasaki City

“CIEA was the first institute to locate at the KING SKYFRONT,” says Nomura. “We decided to move to KING SKYFRONT in 2008 and opened the new research facilities in 2011. I wanted the institute to be visible from any angle, including from the sky, so I insisted on painting our CIEA logo on the roof of our facilities—360 degree visibility!”

Nomura is also the President of the KING SKYFRONT Networking Council, and plays a central role in organizing outreach events to improve the visibility of the 70 or more institutes located at KING SKYFRONT, both within Japan and globally. Examples of events include “children’s summer research gatherings” where school children and their parents participate in activities organized by institutes located at KING SKYFRONT; seminars and symposia with invited speakers from all over the world with emphasis on networking sessions during the events; and smaller gatherings focused on people based at KING SKYFRONT.

“Regular networking and interaction between people from diverse backgrounds and expertise is paramount for maintaining a dynamic and creative KING SKYFRONT,” says Nomura. “Significant developments within the next few years include opening of the Tamagawa Sky Bridge in March 2022 that will connect Haneda Airport with KING SKYFRONT and enable easier interaction with people both in Japan and overseas.

“I hope that this bridge will offer new business opportunities such as medical tourism and infertility treatment as part of collaborations between CIEA and health institutes located nearby including Fujita Health University. I am confident that KING SKYFRONT will continue to be one of the world’s leading research hubs in the life sciences.”

Further information

CIEA website

https://www.ciea.or.jp/en/