Kawasaki City: The KING SKYFRONT Innovation Hub for 21st Century Life Science

Adjacent to Tokyo International (Haneda) Airport lies a unique 40-hectare science and technology innovation hub, the Kawasaki INnovation Gateway (KING) SKYFRONT. The mission of this futuristic facility is to find actionable solutions to issues in regenerative medicine, cancer treatment, and the prevention of 'lifestyle' diseases such as obesity. Importantly, the Japanese government has designated the KING SKYFRONT to be a special zone for international competitiveness development, bestowing it special privileges including reduced corporate taxes and government-backed financial support for projects launched there.

"KING SKYFRONT is the first important step in establishing the Tonomachi area of Kawasaki City as Asia's Silicon Valley," says Nobuhide Kobayashi, executive director of the Coastal Area International Strategy Office, Kawasaki City. "We are confident that the easy access provided by Haneda Airport, in conjunction with the excellent research and development infrastructure, will form the basis for unprecedented business opportunities growing out of innovative science, medicine, and technology." Kobayashi has reason to be confident. Kawasaki City, with its 1.4 million inhabitants, is already home to many blue chip companies including Ajinomoto, Toshiba, Fujitsu, and NEC as well as other global brands that have played a central role in the growth of Japan's economy over the last century.

The KING SKYFRONT is at the heart of the Keihin Industrial Region, encompassing areas of Tokyo and Kanagawa Prefecture, and Haneda Airport. This location offers unprecedented land, sea, and air access to cities within Japan, and the international airport connects the area to Asia, North America, and Europe. "Life science is one of the strategic areas for KING SKYFRONT," says Kobayashi. "We envisage that visiting scientists, medical doctors, and business people will be able to arrive at Haneda in the morning, go directly from the airport to KING SKYFRONT, participate in meetings, and return to their country on an evening flight."

In addition to the excellent technological infrastructure and access, KING SKYFRONT is located within commuting distance of international schools and medical clinics run by English-speaking clinicians—important factors to consider for creating long-term collaborations with overseas partners.

Kazunori Kataoka

Launch of the innovation Center Of Nanomedicine

The innovation Center Of Nanomedicine (iCON) is set to be the flagship of the KING SKYFRONT development. With government startup funding of approximately ¥3.5 billion (US$34.7 million), construction on the project is due to start in 2013, with a formal launch in 2014. Research at the center—carried out by groups from academia, industry, and government—will address such diverse issues as the medico-economic impact of aging populations, curbing the increasing cost of medical care, improving point of care treatment, and establishing new medical markets in developing countries.

Translation of research ideas to the marketplace and fabrication/manufacture are two of the main strategic pillars of the center, emphasizes Professor Kazunori Kataoka of the University of Tokyo, who will be director of research in nanomedicine at the center. "The KING SKYFRONT will offer an open-innovation approach to meet our targets," says Kataoka. "The proximity of Haneda Airport, the availability of clean rooms and related infrastructure for nanofabrication, industrial participation, and professionals to advise on the commercial aspects of research are essential ingredients for taking creative ideas from the laboratory to the marketplace. KING SKYFRONT can be viewed as a highly condensed version of Silicon Valley."

Kataoka is no stranger to big ideas and translational research, having launched the company NanoCarrier in 1996 to commercialize nanosized micelles for targeted drug delivery for the treatment of cancer and other intractable diseases. Notably, NanoCarrier is listed on the *Mothers* (market of the high-growth and emerging stocks) section of the Tokyo Stock Exchange and valued at ¥100 billion (US$985 million).

Underscoring Kataoka's internationally recognized contributions to innovative research in nanobiotechnology, he recently received support from Japan's prestigious national Funding Program for World-Leading Innovative Research and Development on Science and Technology (FIRST) program. With funding of ¥3.6 billion (US$35.7 million) over five years, Kataoka's team will address the following topics: (1) Treatment of cancer stem cells using targeted drug delivery systems in which nanometer-sized drug carriers are able to selectively bind to cancer cells; (2) Treatment of neurological diseases such as Alzheimer's disease using functionalized micelles capable of passing through the blood-brain barrier; (3) Development of nanovaccines that can be stored for long periods of time at room temperature; (4) Fusion of drug delivery platforms with medical devices for minimally invasive "chemical surgery"—such as ultrasonic waves that activate drugs at specific places in the body—to reduce the length of hospital stays for patients; and (5) Development of point-of-care diagnostic devices, such as the use of portable nanofabricated systems to detect microRNAs and specific enzymes.

Kataoka emphasizes the importance of what he calls 'smart healthcare.' "Reducing the time a patient stays in hospital would be a tremendous contribution to society. I am confident that research at iCON can achieve this." As an example of how nanomedicine may eventually be used by millions of people, Kataoka describes the development of the advanced technology necessary to produce hybrid cars. "These cars require a lot of expensive technology. But mass production has enabled cost reductions to within the price range of millions of people worldwide. I predict a similar scenario for nanomedicine."