



## Kawasaki Institute of Industrial Promotion Innovation Center of NanoMedicine

https://iconm.kawasaki-net.ne.jp

# MESSAGE



Chairperson Kawasaki Institute of Industrial Promotion

Takeshi Suzuki

The Innovation Center of NanoMedicine (iCONM) is a research center established by the Kawasaki Institute of Industrial Promotion with the support of Kawasaki City at the "KING SKYFRONT" where Kawasaki City promotes the formation of a world-class innovation center in life science and environmental field which will become Kawasaki's core industry in the future. As the core facility, we are engaged in activities aiming to create innovative technologies in the life sciences field and realization of research outcome.

Optimizing the convenience of location near Haneda International Airport and making the most of the unique features of gathering industry, academia, and government under the one roof, preparing open innovation system through collaboration between diverse human resources both in Japan and overseas, we will keep up promoting R&D and social implementation. Your support and cooperation are greatly appreciated. Thank you.



Vice director, Kawasaki Institute of Industrial Promotion Director General,

Innovation Center of NanoMedicine (iCONM)

Kazunori Kataoka

The Innovation Center of NanoMedicine is located at KING SKYFRONT, an International Strategic Zone in Tonomachi, Kawasaki-ku, Kawasaki City and started its operation as a core research center in April 2015.

Our mission is to realize the Smart Life Society, that is, a society where people are free from disease and become healthy autonomously, and a number of researches are on the way for realization of "in-body hospitals".

In 2022, we started a new project, CHANGE (the Center of Healthy longevity And Nursing innovation with Global Ecosystem), to create tools and systems that enable even non-medical professionals, such as family members, to provide nursing care at home. We are working together with people from various field to realize the vision.

Thank you for your continuous support.

## VISION

- iCONM aims to:
- Become the hub of Keihin-area Health kombinat;
- Be the civic pride of Kawasaki;
- Continuously create new medical technology realizing human dream;
- Become the world's most innovative research center.

## MISSION

iCONM strives to improve the cure rate for the global threat of refractory diseases in order to realize a Smart Life Care Society where people from across the globe can autonomously achieve good health.

- To relieve the burden of medical care on patients and society.
- To join hands with universities and businesses in tackling this task, both domestically and internationally.
- To create a social system that continues to foster innovation.
- To form a community that brings together iCONM, the region, and its citizens.
- To boost the earliest social implementation of cutting-edge techniques and technology.



Summary of the Building Total Floor space / 9,444,04m<sup>2</sup> nber of Parking Vehicles / 36

Communication Areas Magnet Areas 2nd Floor – 4th Floor Ground Floor(Upper part built in wellhole style) • Conference Rooms Large Conference Room (seating capacity 18) ×2 Medium Conference Room (seating capacity 12) ×3 Small Conference Room (seating capacity 6) ×1 Japanese Style Conference Room (seating capacity 6) ×1 Reception Room (seating capacity 4) ×1

• Main Facilities and Functions

Animal Laboratories: Research on Human Disease Models

# **Efficiently Designed**



## Design / **Scheme of the Research Process**

Research related to drug development is conducted in the following order (1) Monozukuri (synthesis), (2) evaluation of efficacy and safety in vitro, and (3) evaluation of efficacy and safety using animals. The 2nd, 3rd, and 4th floors of iCONM are designed for laboratories to conduct research related to steps (1) to (3) and comply with appropriate regulatory requirements. On the 1st floor, there are clean rooms for prototyping medical devices and a workshop that can process materials at the nano

## Magnet Area to Promote **Cross-Cultural Exchange**

There are domestic and overseas scientists with various specialties from academia and companies at iCONM. The Magnet Area is designed as a communication area where people gather to interact each other and promote cross-cultural exchange to effectively produce a synergistic effect that creates innovation.

## LABORATORY



## **Cutting-Edge Equipment and Regulatory Committees**

In order to conduct cutting-edge research, state of the art laboratory facilities with most advanced equipment are necessary. At iCONM, there are many types of cutting-edge research equipment. An administrator is responsible for maintaining each piece of equipment, keeping it in top condition to generate reliable data. Additionally, the regulatory committees strictly review research projects involving ethical considerations, such as genetic recombination investigations and animal experimentation.

## **Incubation Facility for Startups:** "iCONM in collaboration with BioLabs"

Using a part of iCONM as an incubation facility, seed/early-stage start-up companies in the life science field can focus on technology development. In addition, iCONM's research support environment and BioLabs' experience in supporting social implementation as a global incubator will be leveraged to help startups grow.

# "In-Body Hospitals"

## What are "In-Body Hospitals"?

The "in-body hospitals" system is one in which virus-sized smart nanomachines patrol the human body 24 hours a day, detect signs of disease, diagnose it, and even treate it. We aim to realize this system by 2045.



## What is a Smart Nanomachine?

A nanomachine (also called a nanomicelle) is a tiny capsule that encapsulates medicine. iCONM calls these nanomachines "Smart Nanomachines" when specific functions are added to them, such as the ability to reach a targeted location or to detect abnormalities in the body.

Ų, Red blood cells Germs Virus Hair 100µm 10µm 1µm 100nm ×0.1 ×0.1 ×0.1

How Small is "Nano"?



### Further Application of Nanomachine 2

Detects overproduction of enzymes required for cancer cells to metastasize and invade normal tissues and delivers anticancer drugs to the relevant tissues.

► Detects highly invasive cancers after surgery and prevents recurrence

> Micelle-san the nanomachine



# 's Vision for

## CHANGE the medical field with engineering technology

## "CHANGE", a 10-year project actively advanced by iCONM as a core organization

At iCONM, from FY2013 to FY2021, the research project "COINS" (\*1) promoted R&D for the realization of a smart life society, in which people are free from illness and treatment and can obtain health autonomously in their daily lives without the burden of the time, cost, and distance involved in medical care

In "CHANGE" (\*2), the next project launched in FY2022, we will conduct research activities on new themes to meet the needs of society, based on the results developed under COINS. To avoid pandemics and massive conflagration, and stress on the medical system due to the super-aging population, we aim to improve the care literacy of citizens and create tools and mechanisms for home care and develop technologies to delay the decline of physical functions due to aging (aging control) and realize a society with healthy longevity.

\*1 COINS (Center of Open Innovation Network for Smart Health) is Japan) and JST (the Japan Science and Technology Agency).

\*2 CHANGE (Center of Healthy longevity And Nursing innovation with Global Ecosystem) is an initiative under COI-NEXT (Program on Open Innovation Platforms for Industry-academia Co-creation) of MEXT/JST

The "iCONM KiDS" website introduces iCONM's research in an easy-to-understand manner for the public.

## DELIVER to the target

## Nano-sized "Trojan Horse" - Smart nanomachines that target cancer

### Reach the cancer tissue and kill cancer cells from the inside

Blood vessels have thousands of tiny pores nanomachine releases the drug in the acidic carrying oxygen and nutrients to cells. Blood endosomal compartment and kill the cell from inside. vessels in cancerous tissue have larger pore sizes than blood vessels in healthy tissue.

Therefore, by loading the drug in nanomicelles that can only pass through the blood vessels of cancer tissue, it can be delivered only to cancer without damaging healthy tissue.

As such, a system that delivers drugs to the targeted areas in the required quantities is called a Drug Delivery System (DDS).

The surrounding environment of healthy cells generally maintains a neutral environment, while the surrounding area of the cancer cells is slightly acidic. Therefore, the nanomachine is designed to break down in acidic conditions and release the drug around the cancer tissue. The released drugs kill the cancer cells.

Additionally, when the nanomachine containing drug reaches the cancer cells, it gets taken up by the cancer cells. Once inside the cell, the

It is similar to the ancient Greek tale of the "Trojan Horse"; nanomachines get into the enemy (cancer cell) and defeat it from the inside.

**Blood vessel** This isn't our destination! 00 Cancer cell Nanomachine We won't be attacked. We've arrived at our target.

## CREATE medicine inside the body

urther Application o

Nanomachine 3

Intra-articular administration of

which promotes cartilage formation

mRNA that produces a protein

Regeneration of articular

cartilage and treatment of

osteoarthritis

## mRNA – blueprint that copies

When mRNA with the genetic information of the virus surface's "spike protein" is loaded inside the nanomachines and administered into the human body, the spike protein is created in the human cell based on the mRNA blueprint.

This process activates the body's immune system, and antibodies against this spike protein are created. As a result, when the real virus comes in, the body's immune system can attack the virus. The disadvantage of mRNA is that enzymes in the body easily degrade it. Packaging the mRNA inside nanomicelles can protect it from decomposition and prevent it from being attacked by immune cells as a foreign substance.

Moreover, at iCONM, we develop research that modifies the structure of the loaded mRNA with our unique

## Nano machines that help in vaccine preparation

## genetic information

technology and leads not only to antibody production but also to the activation of cellular immunity that attacks infected cells. In addition to infection, we aim to overcome intractable diseases such as cancer and autoimmune diseases.



## MANIPULATE drugs from outside the body

occur only in the affected area surgerv



Administer nanomachines

# the Near Future of **2045**

## Increase the resilience of society with key technology of "in-body hospitals"

an initiative under COI STREAM (the Center of Innovation Science and Technology based Radical Innovation and Entrepreneurship Program) of MEXT (the Ministry of Education, Culture, Sports, Science and Technology,





## https://iconm.kawasaki-net.ne.jp/kids/

## Surgerv with no cut - "Chemical Surgery" using nanomachines

## Realization of one-day surgery using physicochemical reactions that

After delivering nanomachines containing a particular drug to the affected area and focused ultrasonic waves are irradiated externally, a physicochemical reaction occurs only where the nanomachines reach and burn off only the affected area, allowing the lesion to be removed without



# SYMPOSIUM & EVENT

iCONM holds a variety of events to provide a place of learning for many people, from elementary school students to adults, and to introduce iCONM's research and initiatives. We offer event information on our website.



4e

## Symposium for Engineering Innovation of **Nursing People**

We link the fields of nursing and nursing create new industries. We organize dedicated symposiums on related topics as part of these activities.



A hands-on event where each institution in KING SKYFRONT including iCONM brings its own unique character and

introduce science

technology as something more accessible. Many science experiments and experiences will help primary students' summer learning.

## **Exhibition and** Hands-On Event

Exhibitions and various workshops at Kawasaki Municipal Museum in Ikutaryokuchi, Tama-ku, Kawasaki City. Aiming to present iCONM's initiatives to citizens,

we plan and implement the events with Kawasaki Coastal Area International Strategy Headquarters.





iCONM colleagues activate communication

and mutual understanding between different professions and cultures.

## **Lesson Delivery &** Workshop

Internal Event

We are engaged in activities to bring the joy of studying science through interactions and exchanges of ideas and opinions with scientists, such as lesson deliveries and workshops at high schools





2018

5



- Mar. Grants adopted for iCONM construction Adopted by MEXT for "Improvement of international science innovation bases using local resources under industry-university collaboration".
- Oct. Adopted for COI Project, COINS Started Adopted for COI STREAM by MEXT/JST. Started activities as COINS (the Center of Open Innovation Network for Smart Health).
- May. KSF was designated as National Strategic Special Zone
- Apr. iCONM was Established

### **Established Venture Companies from iCONM/COINS** 2015 : AccuRna, Inc. and Braizon Therapeutics Inc. 2018 : iXstream Co., Ltd. 2020 : SONIRE Therapeutics Inc. and iXflow, Inc. 2021 : PrimRNA, Red Arrow Therapeutics Inc., B-MED Inc. and Crafton Biotechnology Co., Ltd.

**Collaboration with Overseas Research Institutions** 

## Nov. Article about "In-Body Hospitals" was **Featured in Nature Magazine** The "in-body hospitals" system, which is the main theme of iCONM and COINS,

was featured in Nature Magazine (Focal Point 15, November 2018).

- **First iCONM Public Seminar Held** and disease to citizens in an easy-to-understand manner.
- Mar. Tamagawa Sky Bridge Opened opposite to the Tamagawa River bank with the opening of the Tamagawa Sky Bridge.

## **COINS Ended**

Nine-year project has ended after many honored achievements. 2021 : 3rd Japan Open Innovation Prize Selection Committee Special Award
 2022 : Innovation Award 2022 "The Minister of Economy, Trade and Industry Award" · JST assessment "S+"

Jun. Incubation Facility Opened Incubation laboratory operations started in iCONM.

## Oct. Adopted for COI-NEXT, **CHANGE Started Operation**

Adopted for "COI-NEXT\*" of MEXT/JST as a full-scale type co-creation area with the Kawasaki Institute of Industrial Promotion as the representative organization. Started activities as "CHANGE\*\*". \* Open Innovation Platforms for Industry-academia Co-creation \*\* Center of Healthy longevity And Nursing innovation with Global Ecosystem

"In-Body Hospitals" initiative was introduced as an example of contributing to regional revitalization by Ministry of Education, Culture, Sports, Science and Technology (MEXT) Science, Technology, and Innovation White Paper for the Fifth Year of Reiwa".

## **Academic Seminar**

We invite leading-scientists from in and out of Japan as lecturers and hold seminars focusing on professional, academic, and hot topics



ICON







Symposium & Public Seminar

We provide the public with lecturers and panel discussions related to the themes of our research projects. We also organize public seminars aiming for citizens' health awareness and young students' career development





DUDA



Established as a diverse industry-academia-government multi-collaborative hub under one roof. Muti-collaboration laboratories gathered here as core institutions of COINS.

Collaboration research started with Universitat Internacional de Catalunya (UIC) Barcelona, Spain. Signed Academic Exchange Agreement and promote academic exchange such as regular internships and academic seminars. Grown into a global research facility that accepts scientists from all over the world such as Thailand and Iceland.

Delivered information mainly about iCONM research development, cutting-edge medical technology,

KSF has grown into a cluster of 70 institutions. Strengthened cooperation with the area

Collaboration with BioLabs, a global incubator with a world-class track record and experience.



biolabs







PITAL IN EVERY BOD



## ACCESS





### Access by Car

<From Tokyo> From Tokyo Metropolitan Expressway(Shutoko) Haneda Line to Tokyo Metropolitan Expressway (Shutoko) Yokoba Line

Take Daishi IC toward Ukishima / Kawasaki City / National Route 409 Turn left at Daishigawara intersection Turn left at KING SKYFRONT Entrance

<From Haneda Airport (Terminal 3)> 5 minutes via Tamagawa Sky Bridge

### Access by Train

Take the Keikyu Daishi Line from Keikyu Kawasaki Station to Kojima Shinden Station (10 mins.) Walk 15 mins. to iCONM.

Buses are available from JR Kawasaki Station, Daishibashi Station (the Keikyu Daishi Line), and Tenkubashi Station (the Tokyo Monorail / Keikyu Haneda Airport Line).

# iCONM

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The "O" in the logo is designed after a nanomicelle, and the colour gradient toward the center represents "infinite possibilities" and a "leap toward the future."

The "water blue" colour highlighted against the "black" of the surrounding letters represents "integrity" and "transparency."

"iCONM" and its logo, "in-body hospitals", and "smart nanomachine" are registered trademarks.

