IVReD

Protecting People
from Pandemics.

INSTITUTE FOR VACCINE RESEARCH AND DEVELOPMENT

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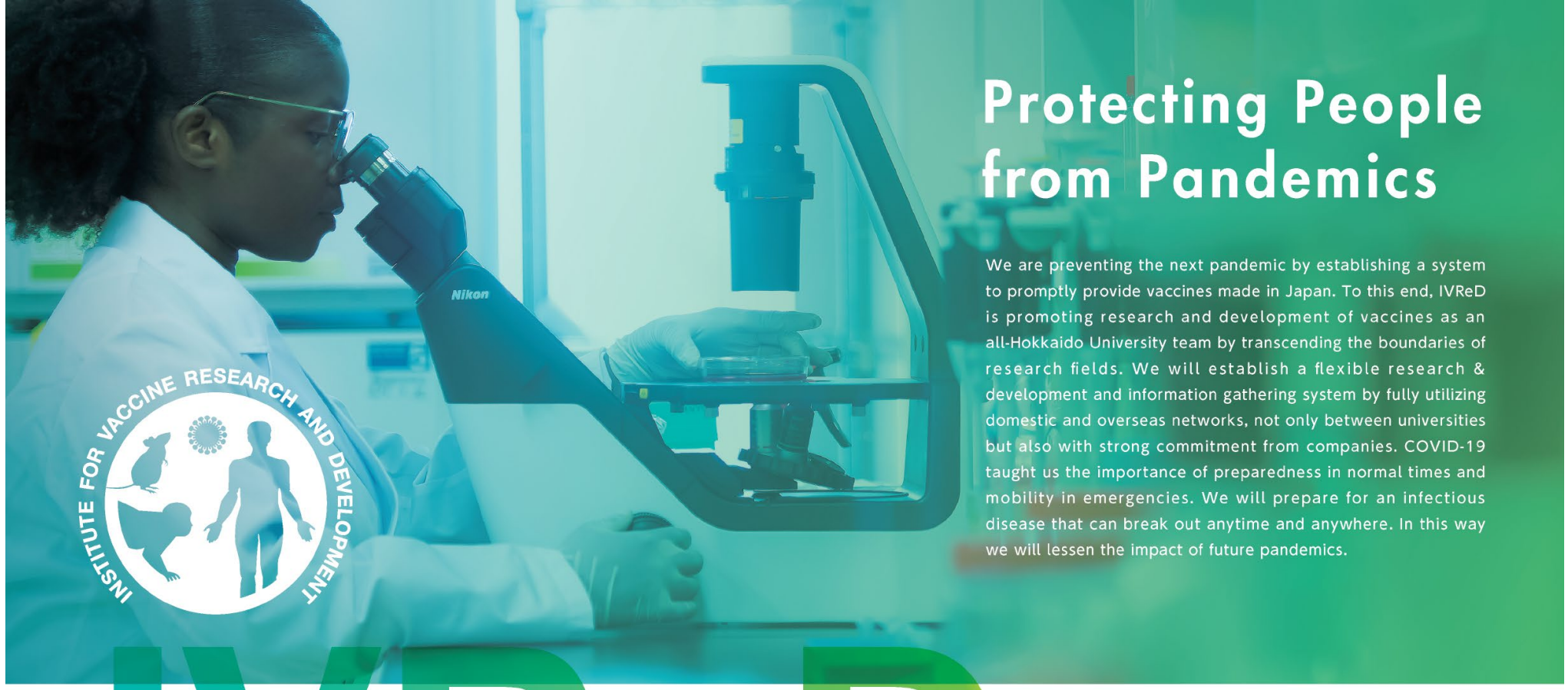
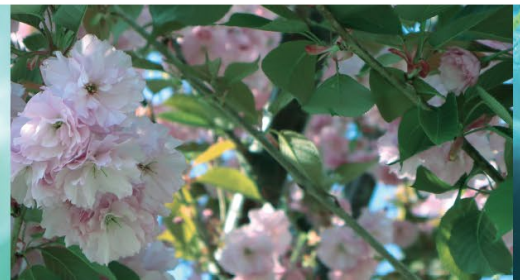


INSTITUTE FOR VACCINE RESEARCH AND DEVELOPMENT

Protecting People from Pandemics

We are preventing the next pandemic by establishing a system to promptly provide vaccines made in Japan. To this end, IVReD is promoting research and development of vaccines as an all-Hokkaido University team by transcending the boundaries of research fields. We will establish a flexible research & development and information gathering system by fully utilizing domestic and overseas networks, not only between universities but also with strong commitment from companies. COVID-19 taught us the importance of preparedness in normal times and mobility in emergencies. We will prepare for an infectious disease that can break out anytime and anywhere. In this way we will lessen the impact of future pandemics.

IVReD



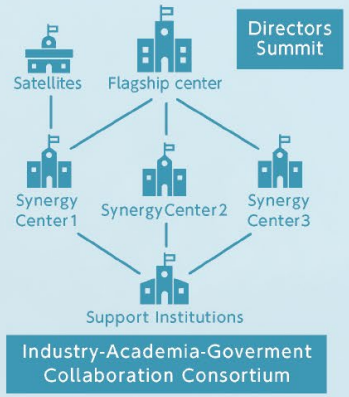
IVReD

ABOUT THE CENTER

The Institute for Vaccine Research and Development (IVReD) was established in October 2022 at the Creative Research Institution, Hokkaido University, as a synergy center along with the University of Tokyo (flagship center), Osaka University, Chiba University, and Nagasaki University (synergy centers) under the support by the Japan Agency for Medical Research and Development (AMED)'s "Japan Initiative for World-leading Vaccine Research and Development Centers" projects.
IVReD will promote basic research for vaccine development and establish a system to employ pre-developed vaccines in the population in cooperation and alignment with institutions, companies, and universities.

The "Japan Initiative for World-leading Vaccine Research and Development Centers"

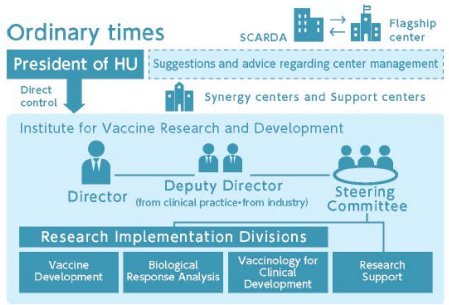
Based on the "Strategy for Strengthening Vaccine Development and Production Systems" (approved by the Cabinet on June 1, 2021), the project aims to establish unprecedented world-class R&D institutes (flagship and synergy institutes), the centers to support the institutes, and to strengthen and promote related research from the inter-pandemic period by focusing on the practical application of vaccines.

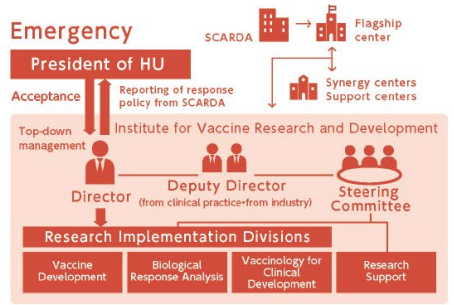


Vaccine R&D System by All-Hokkaido University

IVReD will contribute to the establishment of a system for the development and production of Japanese vaccines through the cooperation with Hokkaido University Hospital, Graduate School of Medicine, Institute for Genetic Medicine, Graduate School of Pharmaceutical Sciences, Graduate School of Veterinary Medicine, and International Institute for Zoonosis Control at the same campus.

During an infectious disease emergency, IVReD will contribute to the rapid development of vaccines through the integrated research system.





MESSAGE

Message from Director

Protect human beings from infectious diseases and their pandemics

As of May 24, 2023, it is reported that there are approximately 766 million people infected with COVID-19 worldwide and approximately 7.6 million deaths. The international community has been hit hard by the COVID-19 pandemic.

Dr. Taylor from the University of Edinburgh in the United Kingdom reported in 2001 that 61% of infectious microorganisms and 75% of emerging infectious disease pathogens are zoonotic pathogens. Hence, it is considered important to understand the infection route of the pathogens. Five pandemics declared by the World Health Organization (WHO) in the past 100 years have been caused by respiratory pathogens, either influenza viruses or coronaviruses. Respiratory infectious diseases have more diverse transmission routes than other infectious diseases, such as droplets, air, contact, oral, and environment, and the transmission speed is high. Hence, the next pandemic will likely be caused by influenza viruses, coronaviruses, or other respiratory pathogens. Apparent from the experience of COVID-19, rapid development of vaccines and therapeutics is essential to overcome the pandemic. Therefore, establishing the system to rapidly develop vaccines and to practically apply these within the community is an urgent need.

Hokkaido University established, ahead of the world, the "Research Center for Zoonosis Control", the predecessor organization of the current "International Institute for Zoonosis Control (IIZC)", as the only institution specializing in zoonosis control. IIZC is maintaining an influenza A virus library storing all subtypes. In addition, as a countermeasure against COVID-19, Hokkaido University is performing environmental, basic and clinical research throughout the University which has led to significant findings to lessen the disease burden. In addition, Hokkaido University is working on tuberculosis, which kills about 1.5 million people every year, through an established international collaboration network for tuberculosis. Based on the results of surveys on the prevalence of drug-resistant strains, new diagnostic methods have been developed and are being implemented in society.

It is with this background that Hokkaido University established the Institute for Vaccine Research and Development (IVReD), which consists of Hokkaido University Hospital (clinical research core hospitals), Graduate School of Medicine, Graduate School of Pharmaceutical Sciences, Graduate School of Veterinary Medicine, Institute for Genetic Medicine, and International Institute for Zoonosis Control, all within the same campus, together with multiple companies such as Denka Company Limited, Shionogi & Co., Ltd., and NB Health Laboratory Co. Ltd. IVReD also incorporates an international research and education network which includes the University of Melbourne and others. IVReD will promote basic research that can contribute to the establishment of vaccine development and production systems by utilizing respiratory pathogens and others detected and isolated by epidemiological studies and stored in the pathogen library in accordance with the flagship vaccine institute of the University of Tokyo.

Prof. Hirofumi Sawa, MD, Ph.D.

Director, Institute for Vaccine Research and Development (IVReD) Hokkaido University

MISSION

After 5 Years Development of vaccines for respiratory infectious diseases

Building a management system for vaccine research and development under the "preemptive strategy" utilizing multiple new modalities

Our strategy

System

- Setting up the clinical specimen collection system
- Streamline R&D system toward social implementation
- Establishing systems for human resource development, international alliances, and research support

Research

- Establishment of Structural Vaccinology
- Promotion of basic research for vaccine development
- Establishment of novel methods to evaluate vaccine efficacy (host response/pathogen detection)
- Development of vaccines for respiratory infectious diseases

After 10 Years Establishing rapid vaccine development systems for respiratory infectious diseases and practical application of vaccines based on the research results

Resolving issues to speed up R&D, and establishing alignments among flagship and synergy vaccine institutes

System

- Establishing a system for rapid vaccine development

Research

- Introducing vaccines for respiratory infections to the community, based on 5 years' achievements

We will promote a **"preemptive strategy"** through basic research that can contribute to vaccine development and practical application of products to contribute to society.

Leading the development of domestic vaccines employing the "preemptive strategy"

Infectious Diseases and Pandemics	System for promptly providing domestically produced vaccines
Emerging infectious diseases → Zoonoses Animal / Human Pandemics likely to be triggered by respiratory infections	"Preemptive Strategies" Library of pathogens with the potential to cause zoonoses Target: Zoonoses → Isolation → Library (A, B; 1, 2, 3) → Vaccine Seeds

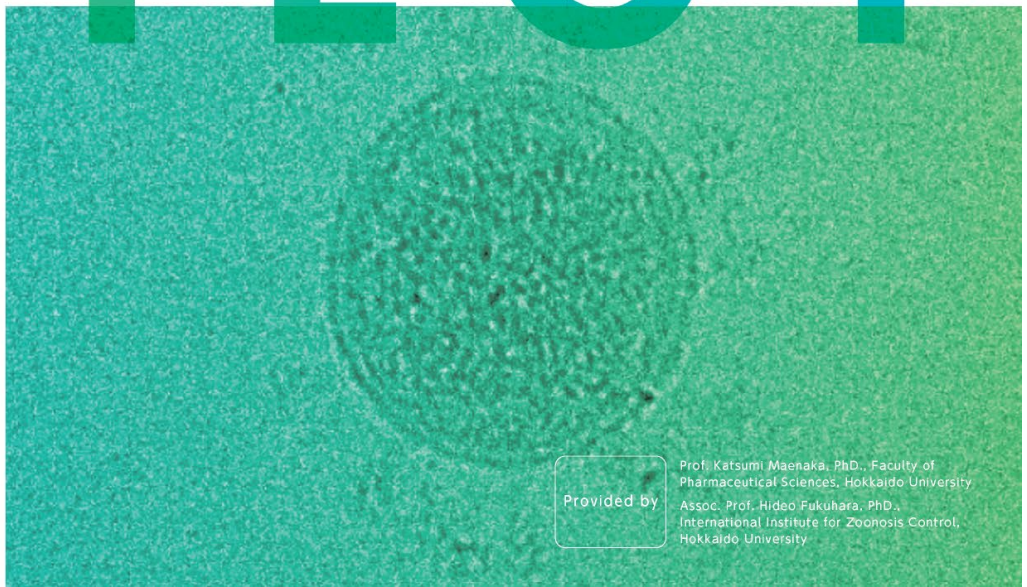
Basic research contributing to the establishment of vaccine development and production system in Japan

STRATEGY

Cryogenic Electron Microscopy (CryoEM) for BSL3 pathogens

Research and Development Goals

IVReD will conduct the "preemptive strategy" to establish a library of microorganisms that could cause infectious diseases in humans, promote basic research that can contribute to vaccine development, and implement products for the community. Specifically, IVReD will isolate and identify microorganisms that may cause infectious diseases in humans from humans, wild animals, domestic animals, arthropods, etc., store them in a pathogen library, analyze their pathogenicity and transmissibility, and select candidates for vaccine development. In addition, IVReD will establish a system that can promptly provide domestically produced vaccines including preparation of vaccine seed viruses, trial production of pandemic model vaccines, and preclinical trials.



Provided by

Prof. Katsumi Maenaka, PhD., Faculty of Pharmaceutical Sciences, Hokkaido University

Assoc. Prof. Hideo Fukuhara, PhD., International Institute for Zoonosis Control, Hokkaido University

IVReD promotes research on vaccine development for zoonotic pathogens with a focus on respiratory infections

◎ Outline of research and development plan

IVReD will conduct research and development targeting 1) influenza, 2) coronavirus infections, and 3) tuberculosis, which are respiratory infections with a high potential to cause the next pandemic or are currently spreading, especially because of the diverse routes of transmission including droplets, air, poor hygiene, oral and environment, and a higher speed of transmission than for other infections.

IVReD will also collect specimens of zoonotic pathogens from wild animals and humans, utilizing the domestic and international collaborative research networks established by the members of the institute. Furthermore, IVReD will artificially create viruses based on the genome information obtained from the database. Additionally, IVReD will construct a library of zoonotic pathogens, mainly respiratory tract infections, and analyze their pathogenicity and transmissibility.

IVReD will promote research on vaccine development for the zoonotic pathogens by selecting those that have the potential to cause future pandemics.

FLOW Flow of Research and Development at IVReD

1 Research on viruses and other pathogens

- Establishment of pathogen libraries
- Collection and provision of information on cutting-edge R&D trends

2 Structural Biology Research

- Analysis of pathogens by cryo-electron microscopy in BSL3 facility
- Determination of structures of complexes between pathogen proteins and antibodies

3 Basic research on vaccines (Division of Biological Response Analysis)

- Analysis of innate immune response in vaccination and infection
- Analysis of acquired immune responses using mouse and human specimens

4 Basic research on vaccines (Division of Vaccinology for Clinical Development)

- Research to improve existing vaccines
- Research for Drug Delivery Systems (DDS) development

5 Research on evaluation systems

- Establishment of evaluation systems (*in vivo*, *in vitro*) for infections
- Development of new diagnostic techniques

6 Clinical research

- Promotion of "reverse translational research" by feeding back the results obtained by efficacy and safety evaluation to clinical trials

IVReD
HOKKAIDO UNIVERSITY

Constructing a World-leading Vaccine Research and Development Center in collaboration with companies and clinical sites

Institute for Vaccine Research and Development

IVReD is closely aligning and cooperating with the flagship institute, the University of Tokyo, and other synergy institutes, and in direct collaboration with industry and clinical sites under the management of the Strategic Center of Biomedical Advanced Vaccine Research and Development for Preparedness and Response (SCARDA) at AMED. IVReD consist of 4 divisions, Vaccine Development, Biological Response Analysis, Vaccinology for Clinical Development, and Research Support, that take actions under the leadership of Director Hirofumi Sawa, Deputy Director Tomio Ikeda, and Deputy Director Norihiro Sato.

Director :
Hirofumi Sawa, M.D., Ph.D.

Deputy director (Industry) :
Tomio Ikeda,
DVM., PhD., EMBA.
(Denka Company Limited)

Denka

IFV Vaccine

Deputy director (Clinic) :
Norihiro Sato, M.D., Ph.D.
(Hokkaido University
Hospital Clinical Research
and Medical Innovation Center)

Division of Vaccine Development

- Isolation of pathogens, establishment of libraries, and elucidating transmission routes
- Structural analysis of pathogens and complexes of vaccine-produced antibodies and proteins in pathogens
- Development of novel drug delivery systems and whole virus particle vaccines

Tomio Ikeda,
DVM., PhD., EMBA.
(Denka Company Limited)
(IFV Vaccine)

Hideyoshi Harashima,
PhD.
(DDS)

Hiroshi Kida,
DVM., PhD.
(IFV vaccine)

Katsumi Maenaka,
PhD.
(CryoEM)

Division of Biological Response Analysis

- Analysis of pathogenicity of zoonotic pathogens
- Analysis of host innate immunity in response to infection and vaccination
- Analysis of host acquired immunity in response to infection and vaccination

Hirofumi Sawa,
M.D., Ph.D.

Koichi Kobayashi,
M.D., Ph.D.
(Innate immunity)

Masaaki Murakami,
DVM., PhD.
(Acquired immunity)

Katherine Kedzierska,
PhD.
(Immune response to
viral infection)

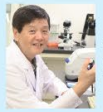
Division of Vaccinology for Clinical Development

- Development of novel adjuvants
- Construction of *in vitro and in vivo* infection experimental systems for pathogens
- Establishment of clinical specimen collection system

Norihiro Sato,
M.D., Ph.D.
(Clinical research)

Akihiko Sato, DVM., PhD.
(*In vitro* evaluation system)
SHIONOGI

Satoshi Konno,
M.D., Ph.D.
(Clinician for respiratory
infectious diseases)



Kazuhiro Matsuo, Ph.D.
(CTL adjuvants)

Kiyoshi Takayama, PhD.
(*In vivo* evaluation models)
NB HEALTH LABORATORY

Division of Research Support

- Liaison to industry and other partners
- Public Relations
- Collection and analysis of cutting-edge information on R&D and infection outbreak trends
- Administrative support for researchers

Yasuhiko Suzuki, PhD.
(Head and Project Manager)

Cooperating Companies
SHIONOGI Denka NB HEALTH LABORATORY

World-class researchers belong to each division

NETWORK

Gathering and sharing information on the latest research trends through domestic and international networks

IVReD aims to achieve results by flexibly building research systems in response to domestic and international trends. Progress in research will utilize a wide range of domestic and international networks established by co-investigators. Specifically, IVReD will prepare for the emergence of infectious diseases by collecting worldwide information on outbreaks of infectious diseases from the Hokudai Center for Zoonosis Control in Zambia (HUCZCZ), overseas partner institutions, WHO, and GOARN.
In promoting basic research for vaccine development, IVReD will collaborate with the University of Oxford, Texas A&M University, the University of Melbourne, and other institutions to collect information on research trends around the world and share it with SCARDA, its flagship institute, and synergistic institutes.

Flexible R&D and information collection system utilizing networks with overseas research institutions

International organizations cooperating in infection disease control

- World Health Organization (WHO)
- Office International des Epizooties (OIE)
- GOARN※ ※Network made up of numerous public health institutions, research institutes, NGOs, etc. that works closely with the WHO to monitor and counter infectious diseases that pose a threat.
- Food and Agriculture Organization of the United Nations (FAO)

ACCESS

Institute for Vaccine Research and Development (IVReD)

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https://www.ivred.hokudai.ac.jp/

Route from the Main Gate

Route from the North 18 Gate