

National Research Center for the Control and Prevention of Infectious Diseases, Nagasaki University



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Our challenge to the World



Plague, smallpox, syphilis, and AIDS, which spread around the world and caused many victims, were all originally nothing more than endemic diseases. Ebola virus disease is also thought to be an endemic disease in the outback of Africa; however, the Ebola epidemic from 2014 to 2016 spread to Western countries as well. It is historically unfounded to consider that diseases endemic to distant countries and regions will never enter Japan.

The development of vaccines, such as smallpox vaccination, and treatments such as penicillin and anti-AIDS drugs saved many lives. Now, we face the urgent need to develop effective prevention and treatment strategies for highly lethal pathogens (Class I Pathogens) such as the ebolaviruses and the pathogens of emerging infectious diseases (Disease X) that will surely appear in the future. To this end, it is essential to have experimental facilities with the highest safety features, which are biosafety level-4 (BSL-4) facilities.

There are currently around 60 BSL-4 facilities in over 20 countries worldwide. In Japan, one was built at the National Institute of Infectious Diseases (currently Japan Institute for Health Security) around 40 years ago. Still, it is only permitted to carry out experiments that lead to the diagnosis and treatment of patients in the event of an emergency. Therefore, there has been a demand in Japan for a BSL-4 research facility with cutting-edge equipment where we can carry out research and development of preventative and therapeutic drugs.

Against this background, Nagasaki University began discussions on the establishment of a BSL-4 facility in 2010. The Ministerial Meeting decided to make it a national policy in 2016.

The BSL-4 facility was completed in 2021. The Minister of Health, Labor and Welfare designated it as a “Facility for Possessing Specified Class I Pathogens, etc.” in January 2025.

However, to fully operate the facility, we need to obtain designation or approval from the Minister of Health, Labor and Welfare for the introduction of “Specified Class I Pathogens, etc”. We are currently working to verify the functions and safety of the facility and carry out the necessary training.

At the CCPID, we will work together with researchers from all over Japan to promote infectious disease research using BSL-4 pathogens.

We are also training researchers who can safely handle these pathogens, as well as experts in biosafety management. Nagasaki has contributed to the advancement of medicine as the first place where Western medicine was introduced in Japan. Vaccination also spread from Nagasaki to the whole of Japan and saved many lives. Now, Nagasaki is aiming to contribute to infectious disease research in Japan and around the world.

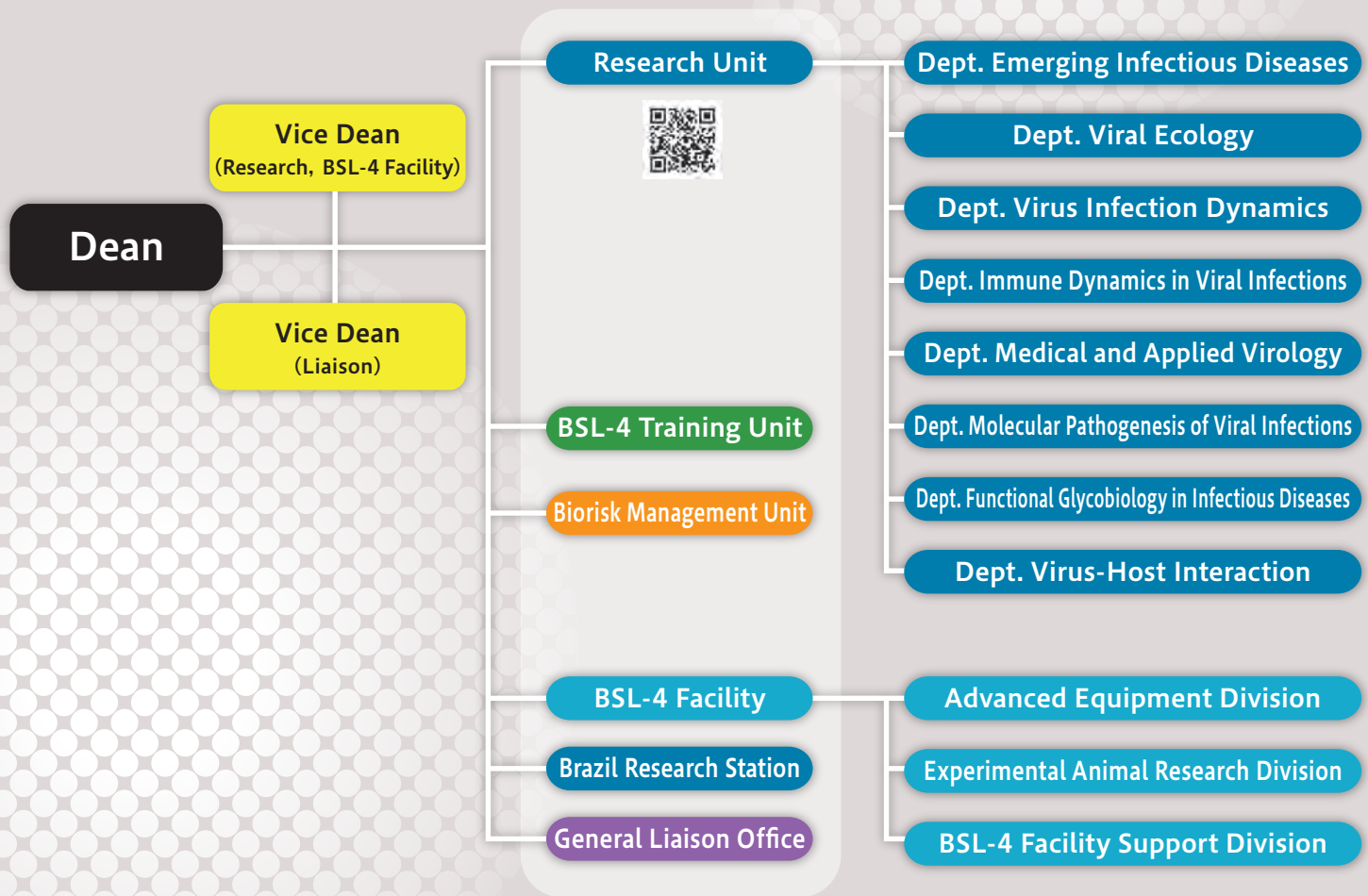
To achieve this, I believe that the most important thing is to operate the BSL-4 facility in an absolutely safe manner, build a relationship of trust with the local communities, and have the local communities watch over our research activities with peace of mind. I sincerely ask for your understanding, cooperation, and support.

March 2025

Hiroyuki Moriuchi, MD, PhD

Dean, the National Research Center for the Control and Prevention of Infectious Diseases (CCPID),
Nagasaki University

Organization of CCPID



Department's Roles

Research Unit	This Unit conducts research on infectious diseases (see the right page for details).
BSL-4 Training Unit	This unit manages a BSL-4 training program aimed at developing skilled and qualified personnel with essential knowledge and skills to safely operate and maintain the BSL-4 laboratory. It provides training for researchers, technicians, and facility operation staff on biosafety procedures, emergency response, and the maintenance of high-containment facility.
Biorisk Management Unit	This unit oversees biosafety and biosecurity at the BSL-4 laboratory and conducts research on biorisk management for high-risk pathogens. The possession and use of such agents are strictly regulated under Japan's Infectious Diseases Control Law, alongside Nagasaki University's own standards. We ensure compliance through regular inspections, documentation, and audits by both national authorities and the university. These efforts support continuous improvement and the safe operation of maximum containment research.
BSL-4 Facility	A facility dedicated to cutting-edge research and education aimed at overcoming infectious diseases caused by BSL-4 pathogens, including Specified Class 1 Pathogens, as well as emerging infectious diseases.
Brazil Research Station	This is the overseas research station established in Brazil. It conducts research on infectious diseases in South America. In addition to the Brazil Research Station, the Institute of Tropical Medicine, Nagasaki University has established stations in Kenya and Vietnam. They collaborate with each other in infectious disease research.
General Liaison Office	This office supports exchange activities with local communities and outreach activities.

Leading Infectious Disease Research in the World

Three tasks to be clarified

How do viruses replicate?

We will clarify the process and mechanism by which BSL-4 pathogens enter, replicate within, and progress to the release of progeny virions outside the cell through the interaction of viral and cellular factors.

How do viruses cause disease?

We will clarify how BSL-4 pathogens infect humans and cause disease by research using cells and experimental animals.

Where do Viruses emerge, and how do they spread?

It is crucial to detect and respond to outbreaks quickly to take effective measures against them. We will clarify the outbreak areas, epidemic periods, environmental factors, natural and intermediate hosts, and transmission routes.

Three areas for research and development

Testing and diagnostic strategies

Early diagnosis of diseases caused by BSL-4 pathogens is critical for preventing the spread of infection and saving patients' lives. We are developing accurate, highly sensitive, and rapid testing and diagnostic strategies that can be used in endemic areas or at quarantine stations.

Vaccines

Since the development of vaccines against BSL-4 pathogens is lagging, we are developing vaccines, including next-generation vaccines, with high effectiveness in preventing infection and/or disease onset and minimal side effects.

Therapeutic drugs

There is no effective treatment for infectious diseases caused by BSL-4 pathogens. Therefore, we are developing therapeutic drugs that inhibit viral proliferation and alleviate symptoms with minimal side effects.

Dept. Emerging Infectious Diseases

We are conducting basic research on highly pathogenic viruses (e.g., **evolvaviruses**) and emerging viruses (e.g., **SFTS virus**). Furthermore, we are developing diagnostic systems, therapeutic drugs and vaccines for infectious diseases caused by these viruses. We are also doing research on the surveillance of viral diseases and identification of novel viruses in human and wild life in Africa, Asia, and South America.

Dept. Viral Ecology

Our research aims to elucidate the ecology of highly pathogenic zoonotic viruses in nature and develop strategies for their control. We primarily focus on arthropod-borne viruses, investigating their transmission between host species, uncovering the molecular mechanisms of pathogenesis, and developing diagnostic, preventive, and therapeutic strategies.

Dept. Virus Infection Dynamics

By using various imaging techniques, we are conducting research to elucidate the molecular basis of infection and pathogenicity expression mechanisms in **filoviruses** and **Epstein-Barr virus**, which cause serious human diseases such as hemorrhagic fever and tumors, focusing on the molecular mechanisms by which various viral proteins regulate host cell membrane dynamics and the cytoskeleton.

Dept. Immune Dynamics in Viral Infections

Investigating the host immune response elicited by viral infections is crucial for addressing public health challenges associated with infectious diseases. We conducted a study utilizing a murine model system to gain a deeper understanding of this fundamental immunological issue. Furthermore, we have advanced the development of therapeutic strategies based on our immunological insights and have contributed to vaccine development against emerging infectious diseases.

Dept. Medical and Applied Virology

Our main research target is **Arenaviruses** which include **Lassa virus**, a causative agent of **Lassa fever**, and other viruses responsible for **Southern American hemorrhagic fevers**. Specifically, we will understand the replication mechanisms of arenaviruses at the molecular level within cells and animals. We strive to develop effective strategies for controlling arenavirus infections by elucidating their pathogenesis and identifying potential drug targets.

Dept. Molecular Pathogenesis of Viral Infections

Our research focuses on developing countermeasures against viral infections, particularly those caused by **bunyaviruses** and **filoviruses**. To understand the pathogenesis of these viral infections, it is essential to clarify both the host response and the dynamics of the virus in infected cells. We investigate the molecular mechanisms underlying viral replication, budding pathways, cell tropism, and the host immune responses.

Dept. Functional Glycobiology in Infectious Diseases

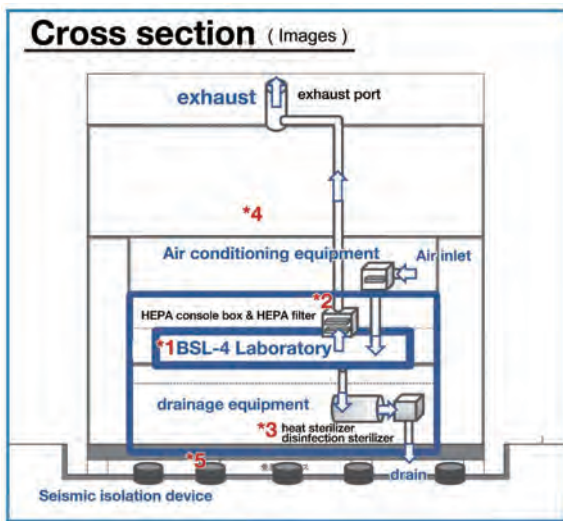
We are studying about viral infections that cause severe symptoms in humans, focusing on **glycans** and **glycan-binding lectins**. We would like to reveal the role of glycans on viral particles especially in zoonotic viral infections. We also try to develop new anti-viral drugs targeting on glycans by establishing **viruses with artificially modified glycans**.

Dept. Virus-Host Interaction

We aim to elucidate the mechanisms of viral infection, proliferation and replication, and to develop new antiviral drugs, by analyzing host factors that control the life cycle of viruses, focusing on "virus-host interaction". We are also doing research on highly pathogenic viruses such as **Ebola virus**, as well as on **HIV-1**, the causative virus of **AIDS**, and **LINE-1**, a retrotransposon.

Various systems support safety at the BSL-4 facility

Structure of CCPID BSL-4 facility



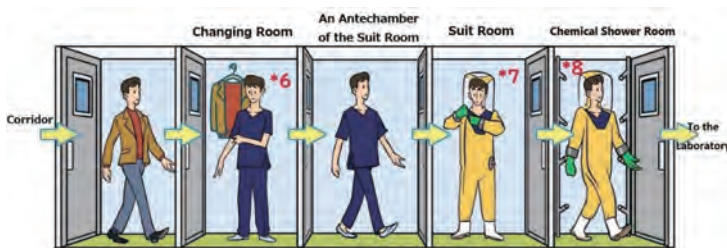
- *1 The BSL-4 laboratory is structurally isolated from the external environment and enclosed within a fully airtight chamber.
- *2 The laboratory is equipped with extensive HEPA filter units for both supply and exhaust air.
- *3 Wastewater from the laboratory is fully sterilized beneath the floor through autoclaving and chemical treatment.
- *4 The upper floors contain support facilities, such as HVAC (Heating, Ventilation, and Air Conditioning) control systems, backup power supplies, chemical shower tanks, and clean air supply systems for PPS.
- *5 The building is constructed on a foundation with high-level earthquake resistance.

Researchers must pass through several rooms to ensure their safety and security when entering and leaving the laboratory. Safety measures are taken to prevent both researchers and the environment from being exposed to pathogens.

Positive Pressure Suits (PPS) in CCPID BSL-4 Laboratory



- 1 Air Supply Hose
- 2 Air Ventilation
- 3 Face Shield
- 4 Airtight Zipper
- 5 Air valve
- 6 Suits filter
- 7 Gloves
- 8 Boots
- 9 Waterproof, tear-resistant, and chemical-resistant materials



- *6 Researchers change from their personal clothes into dedicated laboratory clothing in the changing room.
- *7 Researchers put on their PPS suits in the suit room, where clean air is supplied to the suits from an air tank located on the upper floor through connected air hoses.
- *8 Researchers enter the laboratory via the chemical shower room (note: chemical showers are not used upon entry).



- *9 Researchers exit the laboratory through the chemical shower room, where disinfectant is sprayed from nozzles on all sides for three minutes. This is followed by a warm-water shower for another three minutes to rinse off the disinfectant.
- *10 Researchers remove their PPS in the suit room.
- *11 Researchers then take a shower to cleanse their bodies.
- *12 Finally, researchers change back into their personal clothes in the changing room.

Exchange Activities with Local Communities and Outreach Activities

Outreach

We are disseminating the content of our research activities, which focus on infectious diseases, to the general public, including junior high and high school students, in an easy-to-understand way. Specifically, we hold public lectures in person and online, science lectures at a high school, and “the Summer School of Tropical Medicine and Emerging Viral Infections”, which holds lectures, poster sessions, and lab tours on campus during the summer.



Public Lecture



Science Lecture
at High School



Exhibition Booth at
Summer School Program

Regional Liaison Council

The Regional Liaison Council on the Operation of the CCPID laboratory building has been held as a forum for providing information to the local community regarding the status of the BSL-4 facility and listening to their opinions in dialogue. This council has been established under the Three-party liaison council, consisting of Nagasaki Prefecture, Nagasaki City, and Nagasaki University, to ensure strict control and safe operation of the facility.

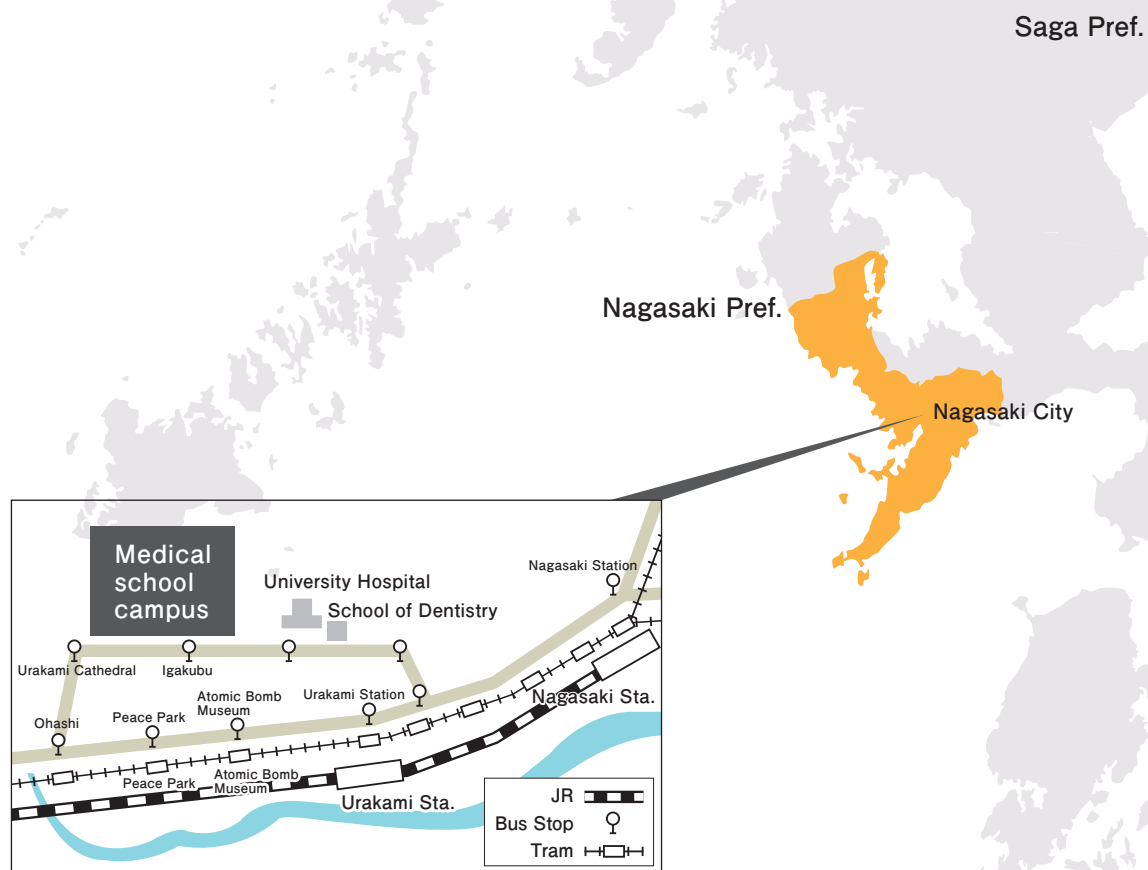


Infectious Disease News

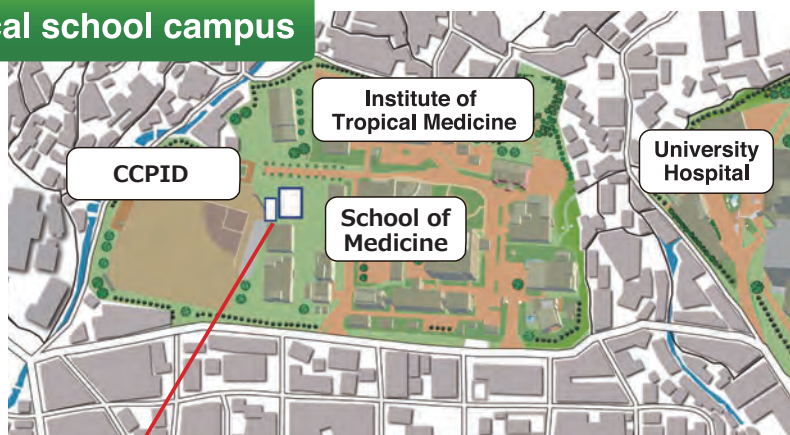
CCPID publishes a local newsletter called “Infectious Disease News”, which introduces a summary of the exchange of opinions at the Regional Liaison Council, information on research at the CCPID, and familiar topics related to infectious diseases. It is distributed door-to-door to around 4,000 households in the neighborhood, providing information directly to the local community.



ACCESS



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