

# NIAH

National Institute of Animal Health,  
National Agriculture and Food Research Organization



## Research to be carried out and the mission and vision of NIAH

# Development and practical implementation of diagnostic/control technology for livestock diseases and zoonotic diseases

The National Institute of Animal Health, National Agriculture and Food Research Organization (NIAH) conducts a wide range of research from basics to development and application on prevention, diagnosis and treatment of animal diseases, as a research institution aiming to “sustain life”. Specifically, NIAH carries out the following R & D and social implementation of results.

- Construction of a monitoring system to detect zoonotic pathogens from animals at an early stage in order to create an infectious disease-resistant society through the One-Health approach
- Development of new diagnostic technologies and epidemic prevention materials that can minimize the damage to farms and exports of livestock products and proposal of measures based on epidemic analysis in order to prevent the spread of exotic diseases and eradicate them quickly
- Development of diagnostic methods and vaccines by the application of advanced biotechnology to reduce the number and damage of major livestock infectious diseases
- Development of a data-driven disease management system that contributes to sophistication and labor saving of livestock hygiene management to solve the labor shortage on the farm and reduce the damage caused by production diseases

## Organization Chart

2022.4.1

President Auditor

Senior Vice President Vice President

NARO Headquarters

Core Technology Research Headquarters  
 • RCAIT/NARO  
 • RCAR/NARO  
 • NGRC  
 • NAAC

Segment I  
 • NFRI  
 • NILGS

Segment II  
 • NIAH  
 • HARC/NARO  
 • TARC/NARO  
 • CARC/NARO  
 • WARC/NARO  
 • KARC/NARO  
 • IAM/NARO

Segment III  
 • NICS  
 • NIFTS  
 • NIVFS  
 • NIAS

Segment IV  
 • NIAES  
 • NIRE  
 • NIPP

NCSS

BRAIN



## Division of research

### Division of Zoonosis Research

Zoonotic pathogens are a significant threat for animal and public health. The Division of Zoonosis Research consists of two groups: Emerging virus group and Enteric pathogen group. We are developing methods to inhibit the infection cycle based on the elucidation of the transmission and persistence mechanisms of pathogens such as influenza virus, pathogenic *Escherichia coli*, *Salmonella*, and *Campylobacter*, and are also analyzing molecules that lead to the development of effective vaccines and drugs. Our goal is to develop effective disease control technology applicable at field of livestock production, to enable early detection and early response of zoonosis derived from animals, and to contribute to the realization of a society resistant to infectious diseases.



One Health recognizes the interconnection between the health of humans, animals, and the environment

### Division of Transboundary Animal Disease Research

Division of Transboundary Animal Infectious Disease Research is composed of two groups: Exotic Disease Group, Kodaira Research Station for Overseas Diseases, and Epidemiology and Arbovirus Group, Tsukuba Campus and Kagoshima Research Station.

Exotic Disease Group develops new technologies for the diagnosis, control and prevention of infectious animal diseases, such as foot-and-mouth disease (FMD), classical swine fever (CSF) and African swine fever (ASF), which have huge impact on livestock production in the country. To avoid unexpected leakage and intrusion of devastating pathogens in the environment, main studies have been conducted at the designated facility, namely biosafety level 3e facility (e is an acronym for exotic. Please check page 5 for details).

Epidemiology and Arbovirus Group conducts epidemiological analyses of transboundary diseases of both domestic and wild animals, including vector-borne diseases. This group defines pathogen-related risk factors for animal hygiene in order to contribute to the improvement of livestock management. At Kagoshima Research Station, this group studies arbovirus disease of domestic animals transmitted by arthropods such as *Culicoides* biting midges which are common in subtropical climate settings.

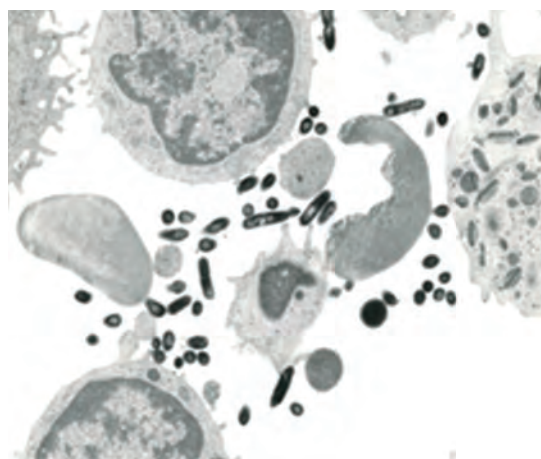


Silver amplification immunochromatography testing (ICT) kit for foot-and-mouth disease virus detection

## Division of Infectious Animal Disease Research

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In the Division of Infectious Animal Disease Research, we are conducting research on bacterial and viral infections in livestock, poultry, and honeybees, as well as prion diseases in livestock. We focus on bacterial infections caused by pathogens, including *Mycobacterium avium* subsp. *paratuberculosis*, *Salmonella enterica*, *Erysipelothrix rhusiopathiae*, *Histophilus somni*, *Paenibacillus larvae*, *Melissococcus plutonius*, and *Clostridium* spp. For viral infection, we focus on bovine leukosis, classical swine fever, porcine reproductive and respiratory syndrome, rotavirus infection, adenovirus infection, and infectious bronchitis. In order to prevent the outbreak of the diseases, we conduct research about the pathogenicity of pathogens, the mechanism of disease occurrence and antimicrobial resistance and aim to develop diagnostic methods and preventive methods such as vaccines.

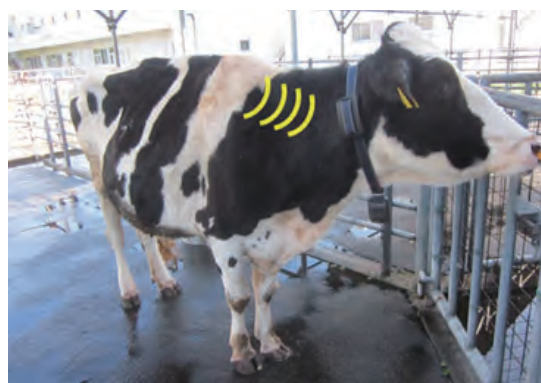


Electron microscopy of *Erysipelothrix rhusiopathiae* inoculated intraperitoneally into mice. *E. rhusiopathiae* possess a capsule and resist to phagocytosis by macrophages.

## Division of Hygiene Management Research

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In the Division of Hygiene Management Research, we are conducting research for the diagnosis, treatment, and prevention of animal diseases by using methods based on biochemistry, toxicology, immunology, and pathology. We are engaged in the development of a data-driven hygiene management system using biological sensing and image analysis technology for the early detection of diseases, as well as a Digital Pathology network system for supporting clinical pathologists. We also work towards the development of mastitis control techniques such as mastitis vaccine and built-in milk sensor system for the milking device. Our research aims to contribute to solving the labor shortage on farms and improving productivity by controlling diseases.



Biological information wireless monitoring system with wearable sensors

## Highly Secure Biosafety Level 3 (BSL3) Facility

While handling pathogens that can infect animals and humans, it is essential to prevent the escape of pathogens from research facilities as well as infection of the concerned researcher handling them. Severity of biological containment is classified from 1 to 4 in biosafety level (BSL). The level of facilities to handle each infectious agent is determined by its risk to humans and animals.

Two BSL3 facilities: the Advanced Research Facility for Animal Health (Tsukuba Campus), and the Specialized Experiment Facility (Kodaira Research Station), can handle pathogens with high risk of causing serious disease in humans and animals.

Infectious pathogens handled at these facilities are rigorously contained by physical conditions such as HEPA filters for controlling intake/exhaust of air, airtight doors to keep negative pressure in experimental areas, and sterilization of drainage through autoclaving. A mandatory shower procedure for employees before leaving the room helps to minimize the risk of external pathogen transmission.

### Specialized Experiment Facility

This facility in Kodaira was built in 1987 for the research on contagious animal diseases that potentially have very serious impact on both domestic and wild animals, regardless of national borders. One example, FMD, is the most contagious disease of cloven-hoofed animals and causes severe economic loss in the livestock industry.

This is the only facility in Japan that is fully conform to the national standard and regulations to manipulate highly pathogenic viruses such as FMD and ASF viruses with the approval of the national authority. In addition, in 2015, the facility was accredited as the international Rinderpest Holding Facility (RHF; category A) by the Food and Agriculture Organization of the United Nations (FAO) and World Organisation for Animal Health (WOAH, founded as OIE). This facility also supports the activities of the OIE Reference Laboratories for Rinderpest and Classical Swine Fever.

Through this facility, we promote collaborative research with overseas institutions and contribute to capacity building activities for domestic and international trainees in this field.



Specialized experiment facility in Kodaira Research Station (Kodaira, Tokyo)



Experimental infection of pigs with FMD virus

## Advanced Research Facility for Animal Health

Constructed in Tsukuba in 2004 for bovine spongiform encephalopathy (BSE) research, this is one of the largest BSL3 animal facilities in Japan, with five BSL3 laboratories and a BSL3 animal experimental area of about 1,900 m<sup>2</sup>.

This facility has enabled BSE transmission experiment, contributing to elucidation of the mechanisms of pathogenesis, as well as to the development of antemortem diagnostic methodology.

The facility is currently being used for research on BSE and animal influenza and supports the activities as OIE reference laboratories for BSE and porcine influenza.



Advanced Research Facility for animal Health (Tsukuba, Ibaraki)



Experimental infection of cattle with BSE

When the occurrence of highly pathogenic avian influenza (HPAI) is suspected in Japan, we promptly perform testing for diagnosis, genetic, and pathogenic characterization of the causative virus. Immediate diagnosis is essential to prevent spread of the infection.

We additionally research the mechanisms of disease dissemination and the development of vaccines for HPAI with a variety of experiments that utilize the advantages of the facility scale.



Experimental infection of chickens with avian influenza virus

# Business and Research Support Necessary for Animal Health Administration

## Department of Animal Disease Control and Prevention

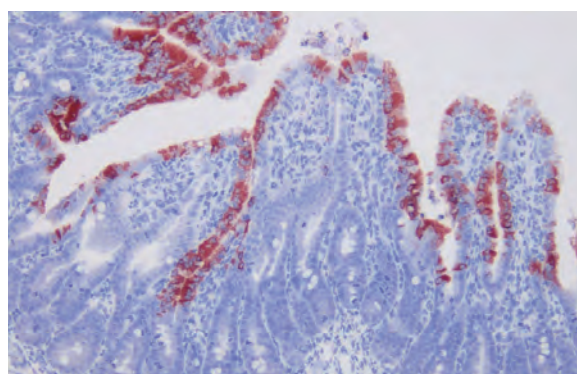
NIAH has developed many kinds of biologicals and, in most of cases, allocated their manufacture and sales to private companies. Currently, NIAH manufactures biologicals that are indispensable, but are not provided by private companies due to the small market.

The Biologicals Production Group is the section that manufactures the biologicals and at present handles 9 kinds of diagnostic reagents for livestock. The group also manufactures and stockpiles the vaccine for rinderpest. Although the virus was effectively eradicated in 2011, our facilities have continued to produce the vaccine under the approval of FAO and WOAHP as the preparedness for recurrence of the disease.



Rinderpest Vaccine

The Diagnosis Supporting Group supports research activities and diagnostic services through technical support such as preparation of pathological specimens, biochemical and molecular biological analysis, tissue culturing, scientific photography, and the construction and management of scientific databases. We also manage the collection of microorganisms, cells, and sera for research activities and diagnostic services. Moreover, we administrate the acquisition of ISO 17025; 2017 at NIAH.



Mucosal epithelial cells infected with porcine epidemic diarrhea virus (red pigments)

For close cooperation with the government, the Cooperation Office of Animal Health Government Affairs is in charge of coordination with the animal health authorities regarding requests for livestock disease diagnosis from local governments, operation for training courses on animal hygiene and distribution of the biologicals.

### Cooperation with OIE

OIE collaborating Centers "Diagnosis and Control of Animal Diseases and Related Veterinary Product Assessment in Asia"

OIE Reference Laboratories "Bovine spongiform encephalopathy, Classical swine fever, Rinderpest, Swine influenza"

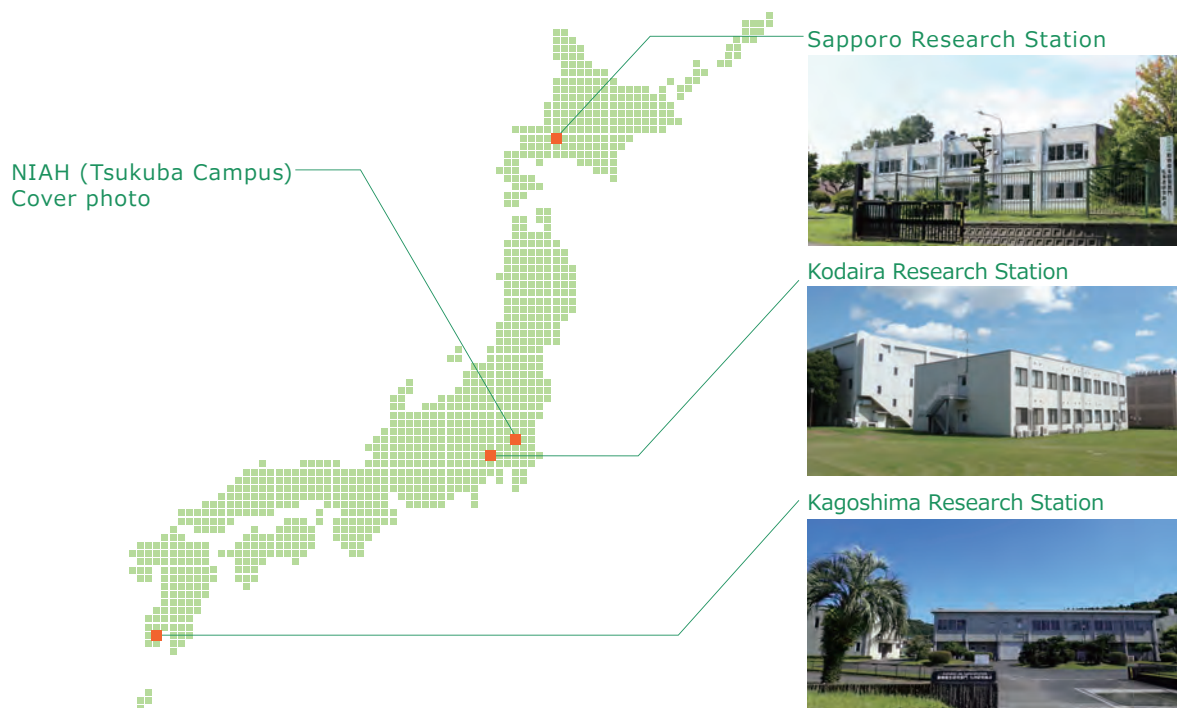
Rinderpest virus holding facilities "Category A, Category B"

# History and Location

## History

- 1891 Founded as the Epizootics Laboratory, annexed to the Bureau of Agricultural Affairs, the Ministry of Agriculture and Commerce
- 1921 Independent as the Institute for Infectious Disease of Animals
- 1947 Renamed as the National Institute of Animal Health (NIAH)
- 2001 Incorporated into the Independent Administrative Agency "National Agriculture Research Organization (NARO)" and renamed to NIAH, NARO
- 2006 NARO reorganized as the Independent Administrative Agency "National Agriculture and Food Research Organization (NARO)"
- 2016 NARO reorganized as the National R&D Agency "National Agriculture and Food Research Organization (NARO)" with the integration of 3 national research institutes

## Map



## Location

### NIAH (Tsukuba Campus)

3-1-5 Kannondai, Tsukuba, Ibaraki 305-0856, Japan

Fax: +81-29-838-7880

### Sapporo Research Station

4 Hitsujigaoka, Toyohira, Sapporo, Hokkaido 062-0045, Japan

Fax: +81-42-325-5122

### Kodaira Research Station

6-20-1 Josuihoncho, Kodaira, Tokyo 187-0022, Japan

Fax: +81-42-325-5122

### Kagoshima Research Station

2702 Chuzan, Kagoshima, Kagoshima 891-0105, Japan

Fax: +81-99-268-3088

## Contact

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