The 28th Hokkaido University – Seoul National University
Joint Symposium

# One Health Approaches to Control Infectious Diseases

**Date:** November 5-6, 2025
**Venue:** Faculty of Veterinary Medicine, Hokkaido University
Organized by Faculty of Veterinary Medicine, Hokkaido University
College of Veterinary Medicine, Seoul National University

Co-organized by One Health Research Center, Hokkaido University

75th Anniversary School of Veterinary Medicine Hokkaido University

One Health Research Center
Hokkaido University

One Health Research Center HRC

**Welcome address for the Breakout Session**
**"One Health Approaches to Control Infectious Diseases"**
**at the 28th Hokkaido University – Seoul National University Joint Symposium**

Since the signing of the inter-university academic exchange agreement in 1997, Hokkaido University and Seoul National University have cultivated a strong and enduring partnership. The annual Joint Symposium, launched in 1998, has become a cornerstone of this collaboration, fostering interdisciplinary research and academic exchange across a wide range of fields. Even during the COVID-19 pandemic, the symposium continued online, demonstrating the resilience and commitment of both institutions. In recent years, the scope of cooperation has expanded to include staff exchanges, joint lectures, and collaborative student programs. The 28th Symposium, to be held in Sapporo on November 5–6, 2025, will once again bring together researchers, educators, and administrators to deepen mutual understanding and promote transdisciplinary approaches to global challenges. This event reflects the shared vision of both universities to advance academic excellence and contribute to a sustainable future through international collaboration.

The veterinary breakout sessions within the Hokkaido University–Seoul National University Joint Symposium have a rich history of fostering academic exchange and collaborative research. From 1999 to 2018, the veterinary faculties of both universities actively engaged in joint initiatives, contributing significantly to the advancement of zoonotic disease research and veterinary education. Although the program was temporarily suspended due to the COVID-19 pandemic and the completion of prior research goals, recent developments have reignited mutual interest, leading to a renewed collaboration centered on the One Health concept.

The 28th Joint Symposium marks the beginning of a new four-year exchange period, with a dedicated breakout session focusing on "One Health Approaches to Control Infectious Diseases." This session aims to address the growing challenges posed by emerging and re-emerging zoonotic diseases in Korea, Japan, and neighboring countries. Through multidisciplinary and multinational dialogue, the session will explore innovative strategies for disease control, public outreach, and the development of future researchers.

Looking ahead, both institutions are committed to sustaining this collaboration beyond the current symposium. By engaging young scientists and expanding partnerships with international organizations, the veterinary breakout sessions will continue to serve as a platform for advancing One Health education and research, contributing to global efforts in animal health, environmental sustainability, and public well-being.

Prof. Yoshihiro Sakoda, DVM, PhD
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# The 28th Hokkaido University – Seoul National University Joint Symposium

## Topics for Breakout Session

### One Health Approaches to Control Infectious Diseases

| Date | Time | Contents | Venue | Notes |
|---|---|---|---|---|
| Wed Nov. 5 | 08:30-9:00 | Visit to Faculty of Veterinary Medicine, HU | Conference Hall, Vet. Med., HU | Prof. Yoshihiro Sakoda, Dean |
| | 09:00-9:15 | Opening ceremony | Conference Hall, Vet. Med., HU | Moderators:<br>- Han Sang Yoo (SNU)<br>- Takahiro Hiono (HU) |
| | 9:15-10:20 | Presentation 1 (17 min + 3 min)<br>- Topic: National Strategies for the Control of Avian Influenza in the Republic of Korea<br>/ Speaker: Prof. Kang-Seuk Choi (SNU) | | |
| | | Presentation 2 (17 min + 3 min)<br>- Topic: One Health for One Future: Initiatives of Hokkaido University One Health Research Center<br>/ Speaker: Prof. Yoshinori Ikenaka (HU) | | |
| | | Presentation 3 (17 min + 3 min)<br>- Topic: Canine Influenza Viruses; Past, Present, and Future Perspectives<br>/ Speaker: Prof. Daesub Song (SNU) | | |
| | 10:20-10:40 | Refreshment | | |

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| | 10:40-11:45 | Presentation 4 (17 min + 3 min)<br>- Topic: HOT-WIRE: Hokkaido university One health Team for Wildlife Incidence REsponse<br>/ Speaker: Assoc. Prof. Takahiro Hiono (HU) | | Moderators:<br>- Yoshinori Ikenaka (HU)<br>- Han Sang Yoo (SNU) |
| | | Presentation 5 (17 min + 3 min)<br>- Topic: Nanoengineered Vaccine and Diagnostic Systems against Infectious Diseases<br>/ Speaker: Dr. Jong-Woo Lim (SNU) | | |
| | | Presentation 6 (17 min + 3 min)<br>- Topic: Advanced and Interdisciplinary Diagnostics: Linking clinical laboratory medicine, research, and education in the Academic Institution<br>/ Speaker: Dr. Naganori Nao (HU) | | |
| | 11:50-12:20 | Q&A and General Discussion | | Moderators:<br>- Takahiro Hiono (HU)<br>- Han Sang Yoo (SNU) |
| | 12:25-14:00 | Lunch and Visit to International Institute for Zoonosis Control (IIZC), HU | Vet. Med. and IIZC, HU | Dr. Naganori Nao (HU) |
| | 14:30-20:00 | Attend Plenary Session and Welcome Reception | Academic Exchange Hall, HU & Keio Plaza Hotel | Presenter:<br>Han Sang Yoo (SNU) |

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| Thu, Nov 6 | 9:30-11:00 | Discussion: Activity plan until HU-SNU Joint Symposium 2026 | Meeting room, Vet. Med., HU | Moderators:<br>- Yoshinori Ikenaka (HU)<br>- Han Sang Yoo (SNU) |
| | 11:00-11:10 | Final Closing | | Prof. Masami Morimatsu, Vice Dean |

# National Strategies for the Control of Avian Influenza in the Republic of Korea

**Kang-Seuk Choi**[1, 2, 3]

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Since the first outbreak of H5Nx highly pathogenic avian influenza (HPAI) in Korea in 2003, epidemics have occurred predominantly during the wintering season, coinciding with the southward migration of wild birds from Siberia and other northern regions. Following 2014, outbreaks have been reported almost annually, imposing significant burdens on the poultry industry and, at times, leading to devastating economic losses. In response, the Korean government has continuously refined its prevention and control strategies. Despite the increasing frequency of H5Nx HPAI virus detections in wild birds, the overall scale of outbreaks in poultry has shown a steady decline. Efforts to control avian influenza are strongly influenced by geographical conditions, poultry production systems, migratory bird dynamics, and national veterinary capacities. Korea has demonstrated resilience by flexibly adapting its policies to meet these changing challenges. This presentation will highlight the comprehensive control measures implemented by the Korean animal health authorities, including early warning surveillance, strict biosecurity, stamping-out and targeted monitoring, One Health–based response frameworks, and advanced diagnostic systems. These efforts have contributed to reducing outbreak severity, safeguarding poultry production, and mitigating zoonotic risk. Nevertheless, the recent rise in H5Nx HPAI infections among diverse mammalian species worldwide—most notably in dairy cattle across the Americas—underscores the growing complexity of the threat and reinforces the urgent need for a strengthened One Health approach. Within this context, the achievements and limitations of Korea's strategies will be critically evaluated, providing insights for future international cooperation and research priorities.

# One Health for One Future: Initiatives of Hokkaido University One Health Research Center

**Yoshinori Ikenaka**[1, 2, 3]

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The concept of One Health originates from the 1860s, when the German pathologist Rudolf Virchow introduced the idea of zoonoses. It was further articulated in the Manhattan Principles issued by the Wildlife Conservation Society in 2004, which emphasized that *the control of zoonotic diseases and the maintenance of ecosystem integrity require cross-sectoral and interdisciplinary collaboration—namely, the One Health approach*. While the principle of perceiving *human health, animal health, and environmental integrity as a unified whole* is intuitively understandable, putting the One Health approach into practice through concrete actions remains a major challenge.

Traditionally, collaborations between medicine and veterinary science have been stressed to mitigate health damage and socio-economic losses caused by zoonoses. However, if the ultimate outcome is defined as *the maintenance and enhancement of human and animal health as well as environmental integrity*, collaboration must extend beyond medicine and veterinary science to include public health, environmental sciences, and social sciences. This requires an integrated perspective that encompasses lifestyle and societal changes, human interactions with wildlife and companion animals, as well as climate change and environmental pollution.

In October 2023, Hokkaido University established the One Health Research Center (OHRC) as an academic hub to advance One Health based on scientific evidence.

- Slogan: *One Health for One Future*
- Vision: Passing on a healthy living environment to the next generation
- Mission: To fulfill academia's role in contributing to the maintenance and advancement of human, animal, and environmental health as a unified entity

OHRC promotes interdisciplinary research and education in four core areas: infectious diseases, conservation medicine, pan-animal studies, and the human–animal–nature bond. Furthermore, OHRC actively engages in knowledge sharing with society, development of specimen banks

and databases, diagnostic and testing technologies, and inclusive One Health practices to ensure benefits for future generations.

In this presentation, we will introduce specific examples of our educational and research initiatives at OHRC, and aim to foster discussions on how to conceptualize and implement *the integrity of human–animal–environmental health* from the perspective of health sciences.

# Canine Influenza Viruses; Past, Present, and Future Perspectives

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Canine influenza viruses (CIVs) represent an important example of influenza A virus adaptation following inter-species transmission. In the 2000s, avian-origin H3N2 viruses crossed the species barrier to dogs, resulting in sustained circulation of H3N2 CIV, which later spread from East Asia to North America. While this virus was transmissible to cats, ferrets were not suitable hosts despite their human-like sialic acid receptor-binding pattern. Beyond avian-to-dog transmission, human seasonal H3N2 and pandemic H1N1/2009 viruses were also detected in dogs, with serological evidence of infections since 2008 and 2009, respectively. Experimental inoculation confirmed active viral shedding, pulmonary pathology, and co-infection potential. Reassortment between H3N2 CIV and pdm H1N1 yielded novel strains, including H3N1 and M-variant H3N2 viruses. Notably, reassortants carrying the HA gene of H3N2 CIV and the M gene of pdm H1N1 exhibited enhanced virulence in mice and more efficient transmission in ferrets compared with prototype CIV.

Recently, concerns have extended to highly pathogenic avian influenza (HPAI) viruses. Dogs were shown to be susceptible to several H5 lineages, and in 2023, clade 2.3.4.4b H5N1 viruses harboring the mammalian adaptation marker PB2-D701N were isolated from cats in East Asia. Infected dogs and cats developed clinical disease, highlighting their potential role as intermediate hosts for avian–human reassortment.

Given the close daily contact between humans and companion animals, CIVs exemplify the potential of dogs and cats to serve as mixing vessels for novel influenza A viruses. Continuous surveillance in these species is therefore essential to anticipate the evolutionary trajectory of CIVs and to assess their future risks to animal and human health.

# HOT-WIRE: Hokkaido University One health Team for Wildlife Incidence REsponse

**Takahiro Hiono[1,2,3,4], Yoshinori Ikenaka[1,3,5], Keita Matsuno[1,2,4], Yoshiki Ichikawa[3], Keisuke Aoshima[1,3], Yuki Otani[1,3], Toyotaka Sato[1,2,3], Naganori Nao[1,2,4]**

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Hazards caused by infectious diseases and poisoning are significant issues not only for humans, companion animals, and livestock, but also for wildlife from the aspect of conservation medicine. However, in wildlife cases, Japan largely lacks official frameworks for the investigations of the cause of death, except that for avian influenza in wild birds. Hokkaido University has collaborated with relevant organizations to conduct lead poisoning tests, toxicological analyses, and infectious disease screenings on various wildlife species. In 2024, One Health Research Center, Hokkaido University, launched a new team, Hokkaido University One Health Team for Wildlife Incident Response (HOT-WIRE), for systematically advancing these activities to develop an efficient wildlife cause-of-death investigation framework. As an example of the HOT-WIRE activity, we have analyzed a mass mortality event of crows, which was negative for avian influenza virus testing. Pathological, toxicological, and microbiological investigations finally indicated that orthoreovirus infection was likely the primary cause of death. Furthermore, HOT-WIRE played a main role in identifying the first marine mammal case of high pathogenicity avian influenza virus infection in Japan. HOT-WIRE involves experts in pathology, anatomy, toxicology, infectious diseases, science communication, and other fields. We will contribute to the concept of One Health through investigating the potential hazards in nature.

# Nanoengineered Vaccine and Diagnostic Systems against Infectious Diseases

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(Re-)emerging infectious diseases pose persistent global threats, highlighting the urgent need for effective strategies in prevention, diagnosis, and control. Nanotechnology offers powerful approaches to meet these challenges through advanced vaccine delivery systems and diagnostic platforms. In this work, we developed nanoengineered polymeric nanoparticles synthesized from biodegradable and biocompatible polymers for the co-delivery of antigens and immunostimulants. These platforms enhanced antigen stability, cellular uptake, and immune activation, resulting in improved humoral and cellular immune responses. In addition, we explored diagnostic applications using umifenovir-modified gold nanoparticles. The aggregation of umifenovir-modified gold nanoparticles with viruses pre-bound to umifenovir was suppressed, indicating that they bind to a specific region of the viral protein. These findings suggest that umifenovir-modified gold nanoparticles can serve as novel agents for visually determining umifenovir resistance in influenza A virus. Together, these nanoengineered systems highlight a promising strategy for strengthening preparedness and response capabilities against infectious diseases.

# Advanced and Interdisciplinary Diagnostics: Linking Clinical Laboratory Medicine, Research, and Education in the Academic Institution

**Naganori Nao[1,2,3], Junya Yamagishi[1,2,3], Tatsuki Sugi[1,2,3], Kyoko Hayashida[1,2,3], Takahiro Hiono[1,3,4], Yoshinori Ikenaka[1,4,5], Yuki Otani[1,4], Toyotaka Sato[1,3,4], Yasuko Orba[1,2,3], Hirofumi Sawa[1,2,3], Keita Matsuno[1,2,3]**

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The COVID-19 pandemic highlighted both the strengths and the limitations of diagnostic systems in Japan, underscoring the crucial role of academic institutions in complementing public health laboratories and routine clinical services. The pandemic accelerated the expansion of PCR capacity, the introduction of next-generation sequencing, and the training of laboratory personnel. These efforts significantly strengthened the national diagnostic infrastructure. However, challenges remain in providing rapid responses to rare and emerging infections.

Severe fever with thrombocytopenia syndrome (SFTS) further illustrates the structural challenges of infectious disease diagnostics. For human SFTS cases, testing systems were promptly established. In contrast, equivalent capacity for animals was initially lacking and was only later addressed through collaborations among government, academia, and professional organizations. This case demonstrates the continuing need for flexible and integrated diagnostic frameworks that encompass both humans and animals.

Building on these experiences, we are developing a One Health comprehensive diagnostic system that allows human and animal specimens to be tested under the same protocols in a “one-stop” manner. Our focus is on advanced assays, particularly those targeting novel and rare infections. Some of these tests have already been implemented as diagnostic services, providing support in cases where standard clinical testing is insufficient.

This initiative not only complements existing infrastructures but also improves preparedness and responsiveness to emerging and re-emerging infectious diseases. By linking clinical

laboratory medicine with interdisciplinary research and education, universities can play a pivotal role in strengthening infectious disease control, advancing One Health implementation, and contributing to sustainable public health systems.