

International Veterinary and Conservation Medicine

Education Program [IVCMEP]

Building upon generations of collaboration between University of Zambia and Hokkaido University for the future of Africa – Japan relations



Human Resource Development for Conservation Medicine

The concept of "conservation medicine" is a new academic field that has spread rapidly around the world since the beginning of the year 2000. Environmental changes caused by human activities and the associated health problems caused by infectious diseases and pollutants are issues that must be solved worldwide. Conservation medicine is based on the concept of One Health, which considers health not only of humans, but also of animals, ecosystems, society, and, more broadly, the entire planet. The promotion of conservation medicine requires multidisciplinary collaboration that transcends the boundaries of the humanities and sciences, including medicine, ecology, veterinary medicine, engineering, agriculture, economics, earth sciences, informatics, literature, and anthropology. We have established a curriculum that allows students from various fields to participate.

Program name & concepts

The acronym "IVCMEP" stands for International Veterinary and Conservation Medicine Education Program. IVCMEP reads as "I've come up". This is based on the concept of a cycle of knowledge in which human resources raised through exchange between the University of Zambia (UNZA) and Hokkaido University (HU) return to their home countries and lead the next generation in their respective countries. A logo is designed to represent the concept of One Health, in which various fields are interrelated and the health of the entire planet is considered, and the other is shaped in green, the base color of the national flags of the Republic of Zambia and school emblem of HU.



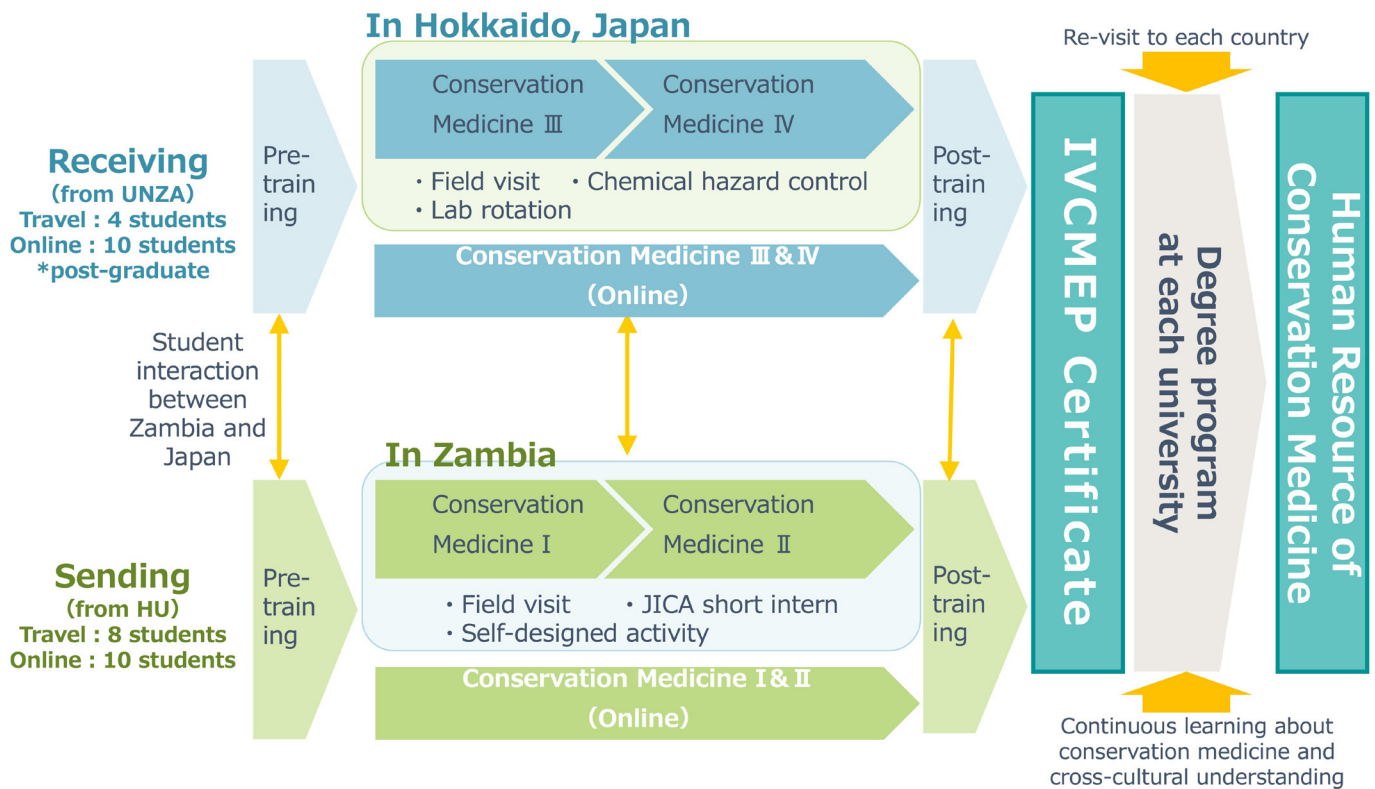
HOKKAIDO x ZAMBIA

IVCMEP

I've come up

International Veterinary and
Conservation Medicine
Education Program

Course Outline



Evaluation based on Competency and Rubric

Competency is used as an evaluation index of achievement that specifically indicates the knowledge, skills, and behaviors that can be summarized in a chart called Rubric when students achieve each goal. Students who are evaluated can understand "what behavioral characteristics were evaluated" and "which behavioral characteristics were inadequate," very clearly when they refer to the assessment sheet. It can greatly help students with their motivations to study. This year, we have created and implemented a rubric with five levels as shown in the table.

Rubric set for IVCMEP 2023

	A	B	C	D	E
1. Understanding of One Health	Able to explain a concept and knowledge of One Health both to experts and general public and discuss social issues related to conservation medicine.	Able to explain a concept and knowledge of One Health both to experts and general public.	Acquired exhaustive knowledge of One Health and understand the concept of One Health.	Acquired practical knowledge of One Health	Not aware of the concept/knowledge of One Health
2. Interdisciplinary Sense	Able to collaborate with people in various related fields and build networks.	Able to collect information and knowledge from other related fields and utilize and organize them for one's problem solving.	Able to collect information from various related fields and organize them for one's problem solving.	Able to collect information from related fields.	Not able to gather information nor knowledge outside of my expertise.
3. Intercultural diversity and international attitude	Able to collaborate with people from different cultures and build networks.	Able to have a discussion on a particular topic with people from different cultures and backgrounds.	Able to communicate ideas to people from different cultures smoothly and achieve mutual understanding.	Able to understand ideas of people from different culture.	Barely interacted with people from different culture.
4. Problem-Solving Skills	Able to solve social issues related to the field of my expertise.	Able to discuss and suggest solutions for social issues related to the field of my expertise.	Able to understand social issues related to the field of my expertise and explain their causes.	Able to name multiple social issues related to the field of my expertise.	Not able to identify social issues.
5. Foreign Language	Able to discuss topics related to One Health in Japanese	Able to explain his/her expertise in Japanese	Able to respond to daily conversation in Japanese	Able to greet people in Japanese	Cannot understand Japanese language at all

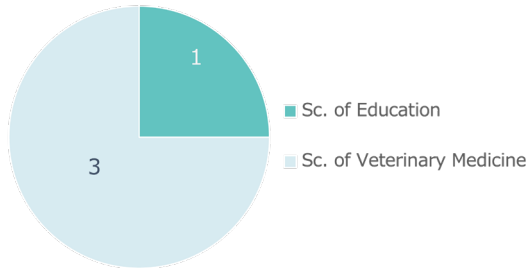


Sika deer (*Cervus nippon*)

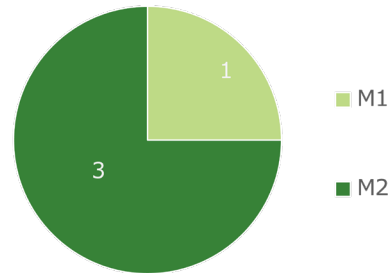
Outline of the Program in 2023

Receiving students from Zambia Participats from the University of Zambia

Students' affiliation



Academic year



Activities in Hokkaido, Japan

Pre-training [June - July]

- Online learning on Japanese culture and language
- Preparation for Lab Rotation

Visiting Hokkaido [Jul. 17 - 29]

- Intensive course for chemical hazard control
- Field visit for environmental management at a mining site
- Field study at Shiretoko National Park
- Lab rotation

Post-training [August - October]

- Activity report presentation
- Report writing
- Lab rotation follow-up

OUTLINE

- General guidance to this class
International Veterinary and Conservation Medicine Education Program to foster the next generation of human resources to bridge between Africa and Japan: Japanese culture
- Japanese culture & society
- Quick language training



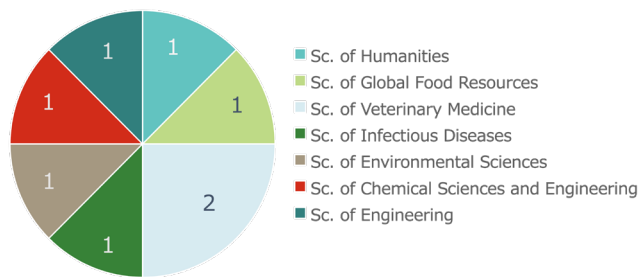
Lab Rotation at Hokkaido University

In order to achieve One Health, the ability to identify/solve issues that are occurring in society today and the ability to communicate across disciplines and cultures are indispensable. Therefore, we set at least two days during the stay in Japan for students to visit laboratories at Hokkaido University according to their interests and expertise, and for students to take the initiative in their activities. This year, students visited laboratories in the School of veterinary Medicine; lab of parasitology, toxicology, and hygiene. The students coordinated the contents with the host faculty as a preliminary study, and their visit to Japan, they trained in field sampling and experimental techniques during the Lab Rotation period, reported their results in the form of presentations on the last day of their stay, and wrote reports after returning home. Presentation materials and reports are also included in this booklet.

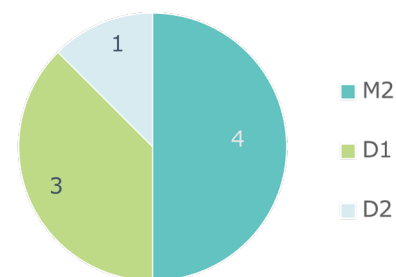


Sending students to Zambia Participatns from Hokkaido Univeristy

Students' affiliation



Academic year



Activities in Zambia

Pre-training [June - July]

- Academic English
- Overseas risk management seminar
- JICA Zambia online seminar
- Preparation for self-designed activities



Visiting Zambia [Aug. 19 - Sep. 3]

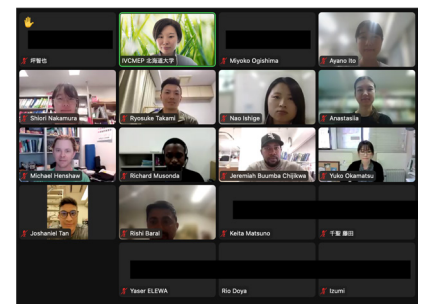
- Mosi-Oa-Tunya Naional Park
- JICA office and project visit
- Kabwe mining legavy and environmental remediation site
- Self-designed activities



Post-training [September - October]

[September - October]

- Activity report presentation (connected to UNZA via virtual meeting system)
- Report submission



Online Courses

Number of participants : 14

Contents

Students selected three classes (equivalent to eight subjects per class) from a wide range of courses, including chemical hazard control, infectious disease control, environmental remediation, and took the courses on-demand using an online plat form provided by the program. After the classes, a Student Interactive Session was held, where students had a question-and-answer session with the lecturer via an online conference system, and active one-on-one discussions were exchanged.

【 Example of the classes 】

- Chemical Hazard Control
 - Field Toxicology & Risk Analysis
 - Chemical Analyses
 - Comprehensive Studies on Chemical Hazard Control
 - Environmental Remediation and Diagnostic Techniques
 - GIS and satellite remote sensing
 - Informatics
- Mechanism, Assessment and Remediation of Environmental Pollution
- Advanced and Comprehensive Studies on Zoonosis Control
- Advanced Seminar on Conservation Medicine

From the next page, reports from participants start

Activity Report at Hokkaido, Japan

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Pre-learning before travel to Japan

June - July, 2023

School of Veterinary Medicine M2

Golden Seulu SANDALA

Pre-travel learning about conservation medicine in Japan

On 8th June, 2023, we had our orientation for the IVCMEP and information pertaining travel, schedule, accommodation and related aspects of the exchange program were discussed. This orientation was conducted by Rio san and Miyoko san via zoom. Dr. Kaampwe Muzandu (Biomedical Sciences Department, School of Veterinary Medicine, University of Zambia) was also in attendance. On 3rd July, 2023, we had presentations on various topics assigned to us. The Presentation were done via zoom. Rio san and Miyoko san facilitated the discussions. Each student was tasked to make an 8mins presentation as follows:

Theme 1: Mining related pollution in Japan – Malifa Mwendelema

Theme 2: Ecological features of Hokkaido – Nathan Singano

Theme 3: Characteristics of Shiretoko National Park – Chantell Bwalya Chileshe

Theme 4: Human-Wildlife Conflicts in Hokkaido – Golden Seulu Sandala

Prof. Michito Shimozuru, (Graduate School of Veterinary Medicine, Hokkaido University, Sapporo, Japan) attended and made comments on the presentations. After corrections, the presentations were submitted to IVCMEP coordinators.

Lectures on Japanese Language, Culture, and Sustainable Development Goals (SDGs) & One Health

As participants in the International Veterinary and Conservation Medicine Education Program (IVCMEP), we engaged in a series of lectures that provided a comprehensive understanding of various facets, including Japanese Language, Culture, Sustainable Development Goals (SDGs), and the One Health concept via Goocus.

The Japanese Language and Culture lecture served as a foundational component of the program, enabling us to grasp its broader objectives. This lecture emphasized the pivotal role of cultural understanding in fostering international collaboration between Africa and Japan. It covered a wide range of topics, including recent developments in veterinary and conservation medicine, insights from medical anthropology, and the integration of sustainable development principles.

Within this context, the lecture shed light on the perceptions of Japanese people, who are often characterized as diligent, courteous, friendly, compassionate, creative, and punctual. It further explored cultural preferences such as an appreciation for peace, the changing seasons, cuisine, clean restroom facilities, and the unique aspect of technologically advanced toilets in Japan, which boast features like seat warming, automatic flushing, and bidet functions.

The discourse on Japanese culture and values introduced us to concepts like “Wabi-Sabi” (appreciation for beauty in simplicity and imperfection), “Omotenashi” (wholehearted commitment to hospitality), and “Ichigo-ichie” (cherishing each encounter as a unique, once-in-a-lifetime opportunity).

The language training component encompassed an introduction to the three fundamental character sets used in the Japanese language—Hiragana, Katakana, and Kanji—along with explanations of their origins and

functions. Additionally, essential phrases and greetings designed to show respect when addressing individuals were provided.

Shifting our focus to challenges within Japan, the lectures delved into economic hurdles, highlighting issues such as a growing relative poverty rate and Japan's heavy dependence on imported resources for energy and food. Notably, Japan's low self-sufficiency rate for energy, standing at a mere 9.6%, was underscored, ranking it low among OECD countries.

The SDGs and One Health lecture addressed the global objectives set for 2030, which encompass economic, environmental, and social dimensions. These goals are built upon core principles, including the creation of a sustainable and thriving planet, the enhancement of the well-being of all individuals and communities, the provision for present and future generations, ensuring inclusivity, and fostering global peace and security.

Within the framework of the One Health concept, the lecture emphasized the interconnectedness of environmental, animal, and human health, highlighting that addressing health challenges in one sector invariably impacts the others. It also stressed the multidisciplinary approach adopted by One Health, drawing expertise from diverse fields, including ecology, veterinary medicine, engineering, agriculture, economics, informatics, and anthropology.

Furthermore, the lectures featured several groundbreaking initiatives that exemplified the application of SDGs and the One Health concept. These initiatives included:

Fuji Eye Ware: A charitable endeavor donating glasses to refugees, enriching lives, enhancing safety, and supporting education.

LIXIL: A pioneering venture developing instant sanitation systems for toilets, benefiting 1.7 billion individuals globally who lack access to basic sanitation. This initiative also focuses on women's and children's security and provides improved opportunities for girls' education.

J.FEC: An innovative producer of Ecofeed, crafted from food waste from factories and stores, which reduces food loss, lowers CO₂ emissions, and contributes to better pig health.

Integriculture: An organization revolutionizing artificial meat production to mitigate the environmental impact of traditional meat production, thereby reducing greenhouse gas emissions, preserving ocean resources, and meeting the demand for sustainable protein sources.

Throughout the presentation, the consistent emphasis was placed on the importance of forging partnerships and alliances with diverse stakeholders, including government agencies, NGOs, local governments, manufacturers, and academia. These collaborative efforts were identified as the cornerstone for achieving the SDGs and effectively implementing One Health initiatives.

In summary, these lectures provided invaluable insights into Japanese culture, society, language, and the global endeavors aimed at realizing the Sustainable Development Goals and advancing One Health initiatives. By merging cultural appreciation with sustainable development principles, the IVCMEP plays a pivotal role in bridging the gap between Africa and Japan, contributing to a harmonious and prosperous future. The lectures underscored the need for global efforts to comprehensively address environmental, animal, and human health challenges.

Workshop on interdisciplinary communication

July 18th, 2023

School of Veterinary Medicine M2

Nathan SINGANO

INTRODUCTION

Conservation medicine is an emerging interdisciplinary academic field that incorporates medicine, ecology, engineering, agriculture, economics, earth science, informatics and anthropology. The IVCMEP program offers a unique and enriching experience that provides valuable insights into various aspects of research and global health challenges. I was honoured to represent UNZA as one of the students who visited Japan for the program.



Fig.1 Icebreaking at the beginning of the workshop

WORKSHOP ON COMMUNICATION SKILLS

One of the first highlights IVCMEP 2023 program was a hands-on workshop titled "Communication Skills to Overcome Differences" by Prof. Tetsuya Horikita, from Nihon University, based on case studies and experiences from veterinarians and livestock farmers. Aside from technical skills gained from various backgrounds, the workshop focused on non-technical skills, leadership, situation monitoring, support and communication. The coordinators facilitated exercises designed to help participants in networking and cross-cultural communication. The exercises first focused on active listening among pairs, paying attention to nonverbal cues and emotions expressed. This was followed by constructive feedback and a review of the exercise, highlighting insights and challenges. The second set of exercises focused on teamwork-building by following the same pattern of feedback and review. The nine-square method, a strategic tool that provided a bird's eye view of activities offered room for improvement and made team coordination efficient and effective. Briefly, the nine-square method is a brainstorming technique that centres the question and lets participants fill up the remaining eight squares surrounding the central question. Building upon the nine-square method, the KJ method developed by cultural anthropologist Kawakita Jiro, was adopted to take creative problem-solving a step further. The KJ method utilizes an induction-based problem-solving approach where participants begin by writing individual ideas on separate cards. Similar cards are grouped based on concepts into smaller groups. These smaller groups are merged into larger groups forming a hierarchical structure of ideas and themes. Lines and diagrams are used to visualize the relationship between these groups. This approach enabled participants to clarify problems, learn and find solutions by themselves.

As the workshop drew to a close, we shared the cycle of life; moments of joy, sorrow, setbacks, achievements, and future aspirations. This last exercise not only enhanced communication skills but fostered deep personal connections.

The workshop was a transformative experience that has fortified my communication abilities and prepared me for excellence in interdisciplinary collaboration, embracing intercultural diversity and tackling real-world problems related to conservation medicine.

Lecture on Food Toxicology

July 18th, 2023

School of Veterinary Medicine M2

Malifa MWENDELEMA

On the 18th of July, 2023, we had a lecture on Food Toxicology given by Dr. Collins Nimako (PhD) at Hokkaido University. During the class, we covered the following topics;

1. Definition of food toxicology
2. Types and sources of food contaminants/toxins
3. Risk assessment strategies for food contaminants
4. Regulatory agencies of food contaminants

We learned that, food toxicology is the study of any substance that, when consumed, may cause harm or adverse effects on the consumer. Therefore, understanding the entire chain (farm to fork) plays a critical role in minimizing contamination because it can occur at any point in the value chain.

We also learned that it is often unavoidable to eliminate contaminants because they occur ubiquitously or from natural toxins but it is advisable to minimize or eliminate potential hazards. Below are some of the food potential contamination sources;

1. Microbiological contamination: This is one of the most common causes of foodborne illnesses globally. Some of the most prevalent pathogenic microorganisms are *Escherichia coli*, *Salmonella* spp, Norwalk virus, etc. Zambia has faced a lot of challenges with foodborne diseases like cholera and salmonellosis.
2. Environmental contamination is also among the major causes of food toxicology. This can result from heavy metals such as Mercury, Cadmium, Lead, and environmental chemicals such as polycyclic aromatic hydrocarbons (PAHs), persistent organic pollutants (POPs) etc. present in the environment.
3. Changes during cooking; Certain temperatures when cooking lead to carbonization and under these circumstances any organic substance is likely to give rise to carcinogens hence the need to emphasize the need to follow manufacturers' instructions on food preparations and recommended temperatures.
4. Natural toxins; Induced natural toxins from molds such as aflatoxins and patulin result in several diseases. Zambians are at high exposure to mycotoxins like aflatoxin because of the high consumption of foods such as Nshima (maize meal) and groundnuts. Therefore,

if storage temperatures, moisture content, storage environment, etc. are not properly observed, diseases will occur.

5. Industrial pollution; Japan and Zambia both share a history of mining and other industrial pollution. Most suspended and abandoned mines cause mine pollution such as water pollution. Japan experienced pollution-related health crises such as Itai Itai disease the past. Zambia is still experiencing water and air pollution in areas near the old mine sites such as the Kabwe mines which lead to poor and polluted vegetation.

We were also taught about the consequences of food toxins, and how risk assessment of the food contaminants can be quantified; food contaminants may exhibit acute (short period) or chronic poisoning (long period) that, causes adverse health effects on humans, and may elicit effects such as diarrhea, stomachache, allergies, and even death.

We were taught how health-based guidance value (HBGV) can be used to establish an exposure level at which there are no health risks.



Fig.1 Lecture by Dr. Collins who is a PhD graduate of Hokkaido University

Lastly, Dr. Collins mentioned some international regulatory agencies of food such as EFSA (Europe Food Safety Authority), Codex Alimentarius Commission for International Standards, and USDA to mention a few. Zambia on the other hand also uses international standards such as the Codex Alimentarius Commission but differs from other countries, Zambia Bureau of Standards (ZABS) facilitates the development of standards in Zambia. The limits of the international standards differ due to different dietary patterns, environmental conditions, and national practices.

In conclusion, food toxicology is a global food safety issue. There are many potentially toxic substances in the environment which may contaminate foods consumed

by people. They include inorganic and organic substances and may originate from a wide range of sources such as microbial contamination, environmental and natural toxins. Therefore, it is important to consider the sources of contaminants in order to understand their pathway into food and water sources for consumption.

GIS practical classes

July 19th - 21st, 2023

School of Veterinary Medicine M2

Golden Seulu SANDALA

In the lectures on GIS and remote sensing, we aimed at enhancing our skills in these fields. We adopted various methods and utilized specific materials to achieve this goal including:

- Practical on-the-job training (OJT) to ensure hands-on learning.
- Utilization of software tools such as QGIS, FIELDNAUT, Locus Map, and others.
- Access to diverse data sources, including raster data like ASTER, Landsat, Sentinel-2, SRTM/DEM, and vector data like GPS tracking data and point data.

Day 1 (19th July):

On the first day, we explored the fundamental concepts of GIS and remote sensing. We learned how to download free GIS data and satellite images and explored topics such as false color composite creation and map generation. On this day, we also went out in the field to collect data points to make a trail around Hokkaido University. Each of us created a map of our track and merged it with the satellite image.



Fig.1 Field survey using smart phone App

Day 2 (20th July):

On the second day we covered:

- Raster Calculator operations.

- Hands-on GPS training for field surveys using smartphone applications.
- Analysis of Digital Elevation Models (DEMs) and watershed delineation.
- Proficiency in handling vector data.

Day 3 (21st July):

On the final day, we focused on advanced topics:

- Georeferencing techniques.
- Classification methodologies.
- Real-world applications, particularly in environmental monitoring.
- An opportunity to present our achievements during the course, with each person allocated 3 to 5 minutes for their presentation.



Fig.2 Final achievement report

Take home message

Throughout the lecture, we acquired a strong foundation in remote sensing and GIS. We became adept at downloading and working with satellite imagery, georeferencing, classification, and their practical applications in environmental monitoring. Furthermore, we realized the significance of GIS in disease research and environmental management, recognizing the pivotal role played by satellite data in these fields.

Toyoha mine plant, Sapporo

July 21st, 2023

School of Veterinary Medicine M2

Malifa MWENDELEMA

Outline and systems at Toyoha

On the 21th of July, we visited the Toyoha plant with other students from South Korea and, we were also accompanied by Dr Emmanuel Temiotan Ogbomida and our program coordinators. Before we toured the Water Treatment Plant, we were given a brief history of the Toyoha Mine at the Ex mineral processing plant. The mine

was started production in 1914. It was known to produce large volumes of crude ores amounting to 22 million tons. This played an important role in Japanese economic development as it was a staple supply of mineral resources such as Zinc, Lead, Copper, Silver, and Indium. Unfortunately, Toyoha Mines was closed in 2006 due to the depletion of ores.

After the lecture, we proceeded to Motoyama Water Treatment Plant. They use an acid mine drainage generation mechanism to purify the underground water before it is discharged to the river.

The mine water and waste water treatment process have three main stages as follows;

1. Neutralization

The mine has three main tanks; pre neutralization tank, neutralization tank and floc making tank. Underground water is pumped up through six pipe lines (200M deep) to the tank. We were told the underground water is usually warm approximately 42°C. The underground water is acidic with pH ranging 3.5- 4 and contains metal ions. The first stage is to neutralize the water by the addition of slaked lime (Calcium Hydroxide) which raises the pH to 9.5-10.

2. Solid-liquid Separation

After the neutralization process, the precipitate flocculate each other resulting to low density and some high density sludge. The low density sludge is recycled back to the neutralization tank while the high density sludge floats on the surface and is later filtered in the precipitation tank.



Fig.1(left) Neutralization tanks

Fig.2 (right) Precipitation tank

3. pH Adjustment

The pH is then adjusted in the pH adjustment tank by diluting the water with sulfuric acid. The pH is adjusted to about 7.7 and turbidity (0.88 recommended) is tested before the water is discharged to Shirai river. They use real time monitoring for all these processes. About 1.83m³/min of water is discharged per day.

4. Dewatered sludge

Lastly, we visited the O shidori-sawa tailing dam. The sludge after dehydration by filter press is transported and

piled in Oshidori-sawa tailing dam.



Fig.3 Students checking quality of water



Fig.4(left) Checking dewatered sledge

Fig.5 (right) Oshidor-sawa tailing dam

Lessons Learnt

Both Japan and Zambia suffered from mining pollution but Japan has put in stringent measures on conservation and restoration on the old mining sites. Below are some of the comparisons and differences of how the mining sites and the management after the closure in Japan and Zambia.

1. Environmental Conservation

“Environmental conservation must be managed not only during operation period but also after the stop of operation” (Toyoha Mine Water and Wastewater treatment module). In Japan, the water is treated before it is discharged to prevent contamination of the surrounding rivers. While Zambia has continued to experience acid rain in areas near the old mining sites.

2. Water pollution

Japan has a history of outbreak diseases such as Itai Itai disease, that were caused by access to contaminated water from mining operations. Zambia on the other hand continues to experience contamination of vegetation grown in areas near the old mining sites. Japan has a water treatment plant enables access to clean water which improves public health by reducing the risk of waterborne diseases and exposure to toxic substances.

3. Environmental restoration

We also learnt the importance of the forest surrounding the area of the old mining site. The forest has a high level

of water capacity holding which contributes to the leveling of river flow and reduces risks of floods and drought. The mine is making an effort to restore the natural environment and biodiversity that was destroyed during the mining operation. While Zambia has continued to experience SO₂ emissions in the air which form acid rain especially in the rain season and this contributes to the deterioration of the soils which become unfit for farming and inhibit growth of vegetation.



Fig.6 (left) Photo by Pheeny Mwaanga at Kankoya in Mufulira with poor vegetation

Fig.7 (right) Toyoha Mining plant surrounding area. Photo by Malifa Mwendelema

4. Job creation

Toyoha water plant mine has created jobs for local residents, boosting the local economy while Zambian old mines have been completely closed and left many people unemployed.

In conclusion, mining pollution is a serious environmental problem that affects many people around the world. We learned that it requires collective action and responsibility from governments, corporations, communities and individuals. Therefore, there are so many ways to reduce the impact of mining, such as implementing restoration and rehabilitation programs.

Institute for Raptor Biomedicine Japan, Kushiro

July 23rd, 2023

School of Veterinary Medicine M2

Golden Seulu SANDALA

There is a worldwide concern on the reduction in the number of raptors. They are among the most rapidly endangered species on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) appendix II.

On July 23rd 2023, we visited the Institute of Raptor Biomedicine Japan (IRBJ). Upon arrival at the raptor center, we attended an illuminating lecture highlighting the innovative strategies for raptor and ecological restoration. The activities covered various aspects of IRBJ's

conservation efforts, including protection and propagation programs, rehabilitation of injured birds, medical care procedures, habitat reintegration, and autopsy processes. The lecture spotlighted three key rapture species; namely, Blackiston's Fish Owl, Stellar Sea Eagle, and White Tailed Eagle.

The main causes of mortality among raptors were, train and car accidents, lead poisoning (from consumption of lead bullets used by hunters and also from bioaccumulation of lead from the raptor diet in the ecosystem) and Electrocutation from electric power lines.

To mitigate these challenges, the IRBJ has implemented measures that include; Putting poles or pillars especially along rivers or bridges to prevent raptors from being hit by vehicles or trains. The institute also conducts training birds to recognize colored insulated stands (their studies have shown that raptors avoid yellow, orange and red colored rods) and implements the installation of colored insulated stands/rods on powerlines to prevent the electrocution of raptors. The institute also promotes the restricting and/or regulation of the use lead bullets for hunting, in attempt to curb the lead posing of raptors. Ultimately, the trip to IRBJ deepened our understanding of raptors' vital role in preserving and harmonizing ecosystems.



Fig.1 Some raptors at the Institute. Photo credit Rio Doya

Comparing the experience at IRBJ to the Zambian set-up, there is need for more conservation efforts for raptors in Zambia. Zambia is home to a number of raptors including Red-necked Buzzard *Buteo auguralis* and black kites, Barn owls, *Tyto alba*; spotted eagle owls, *Bubo africanus*; pearl spotted owlets, *Glaucidium perlatum* and giant eagle owls, *Bubo lacteus*). In Zambia, raptors provide valuable ecosystem services, including controlling rodent populations, regulating snake numbers, influencing cultural beliefs, and contributing to tourist attractions

According to local knowledge, peasant farmers who experience poultry losses due to raptor predation tend to develop negative perceptions and attitudes toward wildlife conservation. In addition, peasant farmers associate raptors with them with mystical omens, and traditional witchcraft. In response, they may resort to retaliatory actions such as killing raptors and damaging their habitats using illegal and harmful methods like animal poisoning, shooting, and trapping. Consequently, there is an ongoing issue of conflicts between peasant farmers and raptors.

Shiretoko National Park, Rausu and Utoro

July 24th-25th, 2023

School of Education M2

Chantell Bwalya CHILESHE

Introduction

Our remarkable student exchange program at Hokkaido University provided us with the incredible opportunity to explore Shiretoko National Park, a remarkable treasure of Japan. Established as Japan's north-eastern national park in 1964 and recognized as a World Natural Heritage Site in 2005, Shiretoko holds a unique place in the world of conservation and biodiversity. This report summarizes our findings and the valuable lessons we learnt during our visit.

Ecology and Bio-diversity

Shiretoko National Park is located at the lowest latitude of all seasonal sea-ice areas in the Northern Hemisphere and this largely influences its ecosystem. Its vegetation change can be observed at different altitudes. Low-lying areas consist of mixed forests of conifers & broad-leaved trees. In terms of bio-diversity, the Park has many land, marine and plant species. Shiretoko is also a habitat for globally rare sea birds such as the Steller's Sea Eagle (*Haliaeetus pelagicus*), the white-tailed sea eagle (*Haliaeetus albicilla*) and other migratory birds. Its Diverse wildlife include the Hokkaido sika deer, brown bears, and red foxes (*Vulpes vulpes*). It is also home to several marine species including: killer whales (*Orcinus orca*), dolphins, seals and penguins as well as fish species include salmon & trout

Brown bears and sika deer in Shiretoko National Park are integral components of the ecosystem, with their activities influencing vegetation, seed dispersal, and providing sustenance for other wildlife. Maintaining a healthy

balance in their populations is crucial for the park's overall biodiversity and ecosystem stability.



Fig.1 Lecture by Mr. Umemura, Shiretoko Foundation

There are two types of bears (brown and black) in Japan. Brown bears are found in Hokkaido only. Bear ecology: Brown bears are omnivores; they eat both plant and animal material. Males weight 100-150kg, females 200-400kg. Their diet varies according to season as they select the most abundant food item. During spring, the brown bear feeds on skunk cabbage, grasses and deer. During summer their food includes wild cherry fruits, lingonberries, cones of dwarf pine, cicada and ants. Additionally, during autumn, they eat a lot of fat from salmon in preparation for hibernation. They also eat Oak acorns and wild vines during autumn. Bear population in Shiretoko is estimated to be about 400-500 (More females than males) with approximately 29-36 bears per km². Shiretoko peninsula has the highest bear density in the world. Estimation based on Hair trap sampling and faecal DNA analysis is done using the QGIS tool to measure the density in the areas of intensive genetic sampling done in 2019 and 2020. On the brown bear home range, we learnt that Shiretoko peninsular seems to be small for the bears. Understanding the relationships between bear populations and human communities is essential in bear management. If the brown bear population in Shiretoko is relatively concentrated on the peninsula, it may have implications for human-bear interactions. It is therefore crucial to study the potential for human-bear conflict in the region, given the proximity of human settlements.

Human and Animal Conflict

Human and animal conflicts at Shiretoko Cape, particularly involving brown bears and Sika deer, have become a pressing concern. In an effort to address human and animal conflict, there has been establishment of the Ezo-Sika Deer Management at Shiretoko Cape. The rapid

increase in deer populations became a serious problem in Shiretoko. More than 600 deer inhabited the Cape hence causing serious damages on vegetation and since 2008, the Ministry of the Environment (MoE) has been controlling deer population in order to ensure the proper density of deer =about 5/km². Effective strategies of controlling deer population include aerial counts and the use of high seats to enhance culling efficiency.

There has also been an increase in Human Bear Conflicts (HBC) due to an increase in human activities (industries, fisheries & warehouses) at the peninsula. This has led to several bear kills with a record of 141 bear kills between 2017-2021. In an effort to control these conflicts, the Parks management, established 5 management zones; bear priority and human priority zones. The park management utilizes bear nuisance control such as culling as a way of wildlife management. This is due to invasion of residential areas, crop damage control, and problem bear control. An electric fence has been implementation and maintained around residential areas and the use of bear sprays and repellents is encouraged to chase away bears. The park management also ensures proper waste management such as the use of bear-resistant containers and removal of carcasses to discourage bears from approaching the residential areas due to food sources. Lectures to locals, visitors and school as well as community meetings are offered by the park's management. Further, regular monitoring and research is done by park authorities.

Forest trekking

During our student exchange program, we had the opportunity to explore both the primary and secondary parts of the forest.



Fig.2 Field trekking with park rangers

While trekking through this natural wonder, we encountered some fascinating wildlife, including the Sika deer and a striking red fox, locally known as "Akagitsune."

We also came across the Mizunara Japanese oak tree, which is known to produce nuts. This tree is not only a vital part of the forest ecosystem but also plays a role in the local culture and economy.

We also observed various types of mushrooms during our hike, which we learned are a crucial food source for the deer inhabiting the forest. This interdependence between flora and fauna highlighted the delicate balance of nature within this ecosystem. Our experience in the forest was not only a memorable adventure but also a valuable lesson in ecology and biodiversity, providing us with a deeper appreciation for the natural world.

Boat cruise

During our visit at Shiretoko National Park, we embarked on a remarkable wildlife adventure with binoculars. We eagerly scoured the landscape for signs of the magnificent brown bear and graceful Sika deer. We spotted brown bears and Sika deer while birdwatching, including white-tailed sea eagles and ravens. We reached the peninsula's tip. This experience deepened our appreciation for nature and biodiversity. During the boat cruise experience, we were reminded of the importance of preserving such pristine environments and the need for responsible conservation efforts.



Fig.3 Finding wildlives from a boat

Shiretoko Goko Lakes

During our visit in Shiretoko, we participated in an informative lecture at the Shiretoko Goko Field House. Following this, we strolled along the elevated wooden path of the Lakeside observation deck, offering us breathtaking views of the area. Our exploration encompassed five exquisite lakes: L. Ichiko, L. Niko, L. Sanko, L. Yonko, and L. Goko. While traversing these virgin landscapes, our observation was greatly enhanced by the aid of binoculars. This activity unveiled a remarkable system of ecological interactions, shedding light on the

intricate relationships between avian species, aquatic ecosystems, and the surrounding flora. Our insights underscored the vital importance of these lakes as hubs of biodiversity and reinforced the significance of continued research and conservation efforts to preserve such delicate ecosystems.

Lessons for Zambia:

Our experience in Shiretoko National Park offers valuable lessons for Zambia's conservation efforts. Just as Shiretoko tries to maintain a delicate balance between nature and human society, Zambia must also prioritize the coexistence of wildlife and communities. Strategies like effective population control, monitoring, and effective conflict resolution can help protect both biodiversity and human interests especially that some national parks here in Zambia are also inhabited by human communities. By studying Shiretoko's successful practices, Zambia can further its commitment to preserving its own natural heritage as well as endangered species.

In conclusion, our student exchange program exposed us to the wonders of Shiretoko National Park and the critical need for conservation and conflict management in preserving our planet's natural treasures. The lessons learned here are invaluable, resonating far beyond the shores of Japan.



Fig.4 Examining electric fences protecting community from brown bears

Summary of Activities at Shiretoko National Park

Prior to the forest trekking, we had a lecture at Shiretoko Nature Foundation by Yoshihiro Umemura san on Wildlife Management in Shiretoko National Park and surrounding area. We learnt that the Park's Management is divided in 2 departments namely: Department of General Affairs and Planning and the Department of Wildlife Management. The later Department deals with the Park Management Section; Wildlife Conservation and Nature Restoration Section. The lecture emphasized the importance of

research and collaboration. In Shiretoko, scientific research informs wildlife management decisions, and collaboration with local communities and stakeholders is essential for success. Lesson for Zambia: scientific research should be more prioritized in order to inform conservation strategies and actively involve local communities and conservation organizations in wildlife management efforts.

Further on, the Department of Wildlife Management in Shiretoko includes a section dedicated to nature restoration. This underscores the significance of restoring and preserving natural habitats for the long-term health of the ecosystem. A lesson for Zambia: Implement nature restoration programs in areas affected by habitat degradation, deforestation, or other environmental challenges to promote biodiversity and sustainability.

Special lecture on Medical Anthropology

July 26th, 2023

School of Veterinary Medicine M1

Nathan SINGANO

RAT – HUMAN ENTANGLEMENTS ANTHROPOLOGY LECTURE

The coordinators invited Prof. Jonathan Stadler from the University of Johannesburg, Republic of South Africa, who gave a lecture titled “Rat – Human Entanglements in Anthropological Perspective”. The lecture shed light on the intricate relationships and conflicts that exist between humans and rats, particularly within the unique context of South Africa.

One of the central themes of the lecture was the post-COVID-19 anxieties surrounding transformations in rat populations and physiology. Notable transformations that have raised concerns include increased hunger and cannibalism, abnormal size, and increased intelligence leading to rats’ resilience to traditional trapping and poisoning methods. While necessary for human safety,

lockdowns unintentionally altered urban spaces for animals, leading to amplified sightings of large numbers of starving rats. Such changes call attention to the adaptability of rats in response to human intervention and environmental shifts.

Prof Stadler also emphasized the multiple identities of rats, viewed as pets, pests and even subjects of scientific research. He further traced the roots and historical evolution of the global war against rats. Rats once considered mere pests, became associated with the transmission of disease in the 19th century. In the 20th century, they were identified as reservoirs of diseases, leading to widespread efforts to eradicate rats and separate them from human populations through public health campaigns.

The lecture delved into rats’ historical role in shaping Johannesburg’s racial geography during the pneumonic and bubonic plagues and the geopolitical implications. Particularly in South Africa, human rat entanglements have been more pronounced in impoverished urban spaces, predominantly inhabited by black communities. Neglect and limited city service in these areas have often led to rat infestations with residents unfairly shouldering the blame.

These urban rat conflicts were presented as a complex issue that goes beyond pest control. Accidental poisonings such as children ingesting rat poisons and intentional dog poisoning were underlined as consequences of the war against rats.

The lecture underscored the need for comprehensive research into how human-rat relations define landscapes, especially in impoverished communities where rats are regarded as the sole problem. Overall, the lecture provided a comprehensive understanding of the intricate dynamics between rats and humans, highlighting the need for a holistic approach to address the multifaceted challenges posed by these entanglements in South Africa and beyond.



An adult brown bear on the shore, Shiretoko

Student Report on Lab Rotation

Students visited laboratories of their interest for intensive learning and lab tour

Graduate School of Veterinary Medicine

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NGS data analysis hands-on training

School of Veterinary Medicine M1

Nathan SINGANO

Another enriching experience under the IVCMEP program was practical laboratory rotations. Before embarking on the journey to Japan, each participant was allowed to choose a research laboratory at Hokkaido University that closely aligned with their research interests. The IVMCEP coordinators were very helpful in facilitating collaborative relationships with esteemed professors and their respective laboratories. I had the privilege of gaining hands-on experience in Bioinformatics and Vaccine development.

[Nanopore Sequence Data Analysis, Department of Bioinformatics IIZC](#)

The main objective of this session was to equip participants with the skills and knowledge essential for proficiency analysis of data generated through nanopore sequencing technology. The nanopore sequence developed by Oxford Nanopore Technologies Ltd falls under the Next Generation Sequencing (NGS) platform. NGS is a high-throughput methodology that enables rapid sequencing of DNA or RNA. Unlike traditional sequencing platforms, for instance, Sanger, which yields bulk data

after running a sequence, nanopore sequencing provides real-time data. Additionally, nanopore sequencing has several advantages such as fast sequence runs, long reading lengths and low instrumental and operational costs. This has made whole genome sequencing more affordable and readily accessible even in resource-constrained settings. Nanopore sequencing has now found widespread utilization in space exploration missions and low- and middle-income countries (LMIC). Despite this significant progress, in sequencing technology, there is a huge pile of biological data with few technical expertise to analyse and make sense of it. This is precisely where the field of bioinformatics plays a vital role, with bioinformaticians stepping in to bridge this critical gap with expertise in biology and computer science.

After a brief introduction to NGS and nanopore sequencing, the practice session commenced with installing essential software packages, Putty and WinSCP and establishing server access. These initial steps provided the necessary resources to engage in hands-on data analysis. After successfully configuring and synchronizing Putty and WinSCP with the private servers located in the International Institute for Zoonosis Control (IIZC), Hokkaido University, the following phase of the rotation was familiarization with basic Linux commands. This step was crucial for easy navigation and interaction with the command line interface within the server environment.



Hands-on lesson of NGS analysis

The coordinator of this session, Miss Dela, PhD fellow, gave a brief overview of the data for practice, starting

from the collection of bat samples, amplification using Polymerase Chain Reaction (PCR) and sequencing using nanopore sequencer Minion which produced a fast5 raw data file.

The session proceeded with base calling using Guppy, in layman's terms, it is the conversion of the fast5 raw data from the sequencer into DNA bases A, T, C and G. The resulting fastQ files were merged and manipulated into a fastA file. FastQ and fastA are text files that store sequence data. The fastA sequence file was identified using the sequence comparison program, BLAST. The sequence was compared against a reference viral database maintained by IIZC. The outcome of the analysis revealed the presence of a virus in the bat samples that were originally collected. Ultimately, the significance of this analysis extends beyond the laboratory, emphasizing the importance of wildlife and public health surveillance. This laboratory rotation exemplifies the multidisciplinary approach of conservation medicine through the integration of science, public health and veterinary medicine to address critical issues at the intersection of humans, wildlife and the environment.

Institute for Vaccine Research and Development (IVReD)

School of Veterinary Medicine M2
Malifa MWENDELEMA

On the 27th of July, we visited the Institute for Vaccine Research and Development, where we were hosted by Dr. Hirofumi Sawa and Dr. Gabriel. Dr. Sawa provided an introduction to the usage of bioinformatics and discussed the recent activities of the center. We learned that IVReD was established on October 4, 2022, as a direct organization under the president of Hokkaido University, along with SCADA management. We also learned about how it collaborates with companies and clinical facilities. IVReD boasts a team of the world's top 8 researchers, each of whom belongs to a research implementation division. Among them are 1 University Professor Dr. Kida and three Distinguished Professors: Drs. Harashima, Suzuki, and Sawa. Dr. Sawa highlighted how they have already initiated discussions on simulations of actual achievements related to emergent events caused by infectious diseases, in collaboration with Hokkaido University members. He also showed us some of their research projects and shared some of their published

works. IVReD has international collaborations worldwide, including Zambia. The Hokkaido University Center for Zoonosis Control in Zambia (HUCZCZ) is located at the University of Zambia, School of Veterinary Medicines.

After Dr. Sawa's lecture, we attended another one conducted by Dr. Gabriel. This lecture focused on Bioinformatics in the times of COVID-19. Dr. Gabriel provided us with general information on SARS-CoV-2 and discussed the severity of the virus. We learned about the origins of SARS-CoV-2, which is believed to have originated from bats and undergone a recombination process. Dr. Gabriel also explained how they searched for severity factors, mutation patterns, water surveillance, and SARS-CoV-2 sequencing applications. He presented a sequencing workflow chart using MinION by Oxford Nanopore Technologies (ONT) and iSeq 100 by Illumina. MinION (ONT) is a portable tool that can be utilized in various fields and is cost-effective compared to other Next Generation Sequencing (NGS) technologies. The information obtained from sequencing plays a crucial role in the development of vaccines, diagnostic tests, and much more.

In the afternoon, we had the opportunity to visit the Cryo-electron microscopy facility and the IVReD animal management facility. The Cryo-electron microscopy was mesmerizing. Even from the computers, we were able to appreciate its incredible power in visualizing biological structures at near-atomic resolution, which is instrumental in structural biology for studying three-dimensional (3D) biological structures.



Learning about cryo-electron microscopy by Dr. Shingai

Risk Analysis using SIR Model

School of Education M2
Chantell Bwalya CHILESHE

Based on individual research interests, during the lab

rotation, I had a lecture on Network analysis and disease dynamics using SIR (Susceptible, Infected and Recovered/Removed) model with Isoda sensei. Network analysis and disease dynamics using SIR model. We covered the description of SIR model which consists of Susceptible, Infected and Recovered/Removed. Further assumptions of SIR model were also looked at. I learnt that understanding these assumptions is cardinal for effectively using the model in disease dynamics analysis.

Prior to the lecture, I was instructed to download the R programme and install the TinnR package, as well as the Tinn-R editorial tool, to facilitate editing. This preliminary step was essential to acquaint me with the R environment and its utility in statistical computing and data analysis. I then learnt about R: we explored how changes in the parameters beta (transmission rate) and gamma (recovery rate) influence the shape of the model's output. During this lecture, I also learnt that, the R Console is the central interface for interacting with R, executing commands, and managing data, while R Graphics provides the tools and functions needed to create a wide range of data visualizations and plots for data exploration and communication of results. This practical exercise during my exchange program at Hokkaido University illuminated the intricate dynamics of infectious diseases using the SIR model. It highlighted the significant impact of beta and gamma on the time at the peak of infection and the total number of infections within a population. This newfound knowledge contributes to a deeper understanding of disease dynamics and their implications, further enriching my future aspirations to become a data analyst.



Epidemiology and risk analysis training

Lessons for Zambia: Zambia can enhance its data collection and analysis infrastructure to inform timely responses to disease outbreaks. This includes monitoring infection rates, vaccine coverage, and treatment

outcomes. The Ministry of Health ought to place more emphasis on the role of data in decision-making as this is crucial for application in Zambia to combat diseases like malaria and COVID-19. Understanding disease models, data analysis with tools like R, and effective parameter manipulation can lead to development of early warning systems thereby improving public health outcomes. Further on, Zambia can greatly benefit from training its researchers and health professionals in R to analyse and interpret disease data effectively.

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Division of Biologics Development

School of Veterinary Medicine M2

Golden Seulu SANDALA

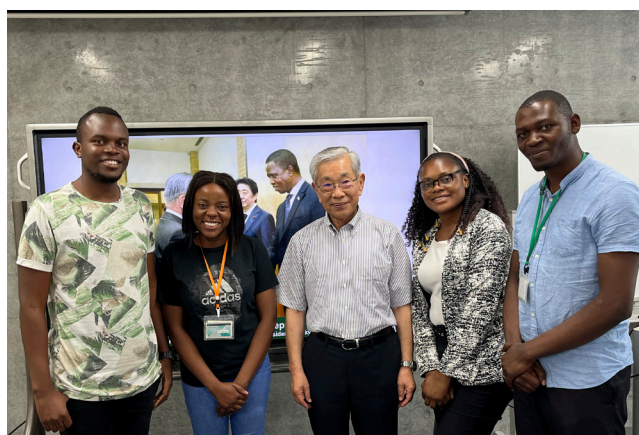
In the morning, we attended a lecture by Dr. Shingai where he gave an overview on what vaccines are and further described the activities of the Division of Biologics and vaccine immunology in pioneering groundbreaking research in vaccine development, especially influenza virus and SARS-CoV-2. In this lecture we learnt that influenza viruses have high mutation rates resulting from both antigenic drifts and antigenic shifts in the Hemagglutinin (HA) and the Neuraminidase (NA) proteins. Dr. Shingai discussed how Hemagglutination assays are used to measure how well influenza viruses can aggregate or agglutinate red blood cells, giving important details regarding the virus's infectiousness and the potency of its interactions with host cells through the viral hemagglutinin proteins. The most common and virulent influenza strains in the area can be found using this data, which is important for choosing which strains to include in the seasonal influenza vaccination. Assays for hemagglutination inhibition, on the other hand, are essential for evaluating the efficacy of potential vaccine candidates. Scientists can evaluate the vaccine's capacity to induce a protective immune response against certain influenza strains by assessing how well antibodies in those who received the vaccination can suppress hemagglutination. He also briefed us on how the division was conducting research to develop and compare Split Virus Vaccine (SV) and Whole-Particle Virus Vaccines (WPV) in the fight against Influenza viruses.

After the lecture, we had an opportunity perform mock

Hemagglutination Assay and Hemagglutination Inhibition Assay (HA-HIA) using eggs and Phosphate buffer saline (PBS). The PBS was representing the influenza vaccine.

In the afternoon, we had a special lecture from Prof. Hiroshi Kida, on pandemic preparedness with SARS-CoV-2 and Highly Pathogenic avian Influenza virus (HPAIV) being classical examples. He highlighted the drivers or causes of zoonosis to be rapid population growth, deforestation, global warming and globalization. As part of the discussion points, Prof. Kida pointed out how establishment of the International Institute for Zoonosis Control on April 1, 2021, marked a significant stride towards enhancing global preparedness for zoonotic pandemics. The collaboration between the Zoonosis Research Unit, the International Collaboration Unit, and the Veterinary Research Unit, all under the auspices of Hokkaido University, exemplifies the critical role of cooperation in tackling diseases that transcend borders. The lessons learned from the COVID-19 pandemic underscore the imperative of international synergy in addressing zoonoses effectively. Operating in alignment with the One World, One Health concept, this institute conducts integrated scientific research and educational initiatives. These efforts are aimed not only at controlling existing zoonotic diseases but also at fortifying global readiness for potential future pandemics. By fostering

international partnerships and knowledge exchange, such collaborative endeavors stand as a cornerstone in the pursuit of a safer and healthier world.



After the special lecture by Prof. Kida

We ended the day by listening to a presentation from Chimuka Handabile, PhD student from Zambia, studying at Hokkaido University. She shared her research findings on Influenza vaccines regimens. After her presentation, we had an interactive session with her asking about various subjects ranging from school to life in Japan and opportunities for studying in Japan.

Overall, this was an enriching and mind-opening experience inspiring innovation and desire to learn more and contribute to the well-being of both animals and humans.



Historical farm site at Hokkaido University in summer