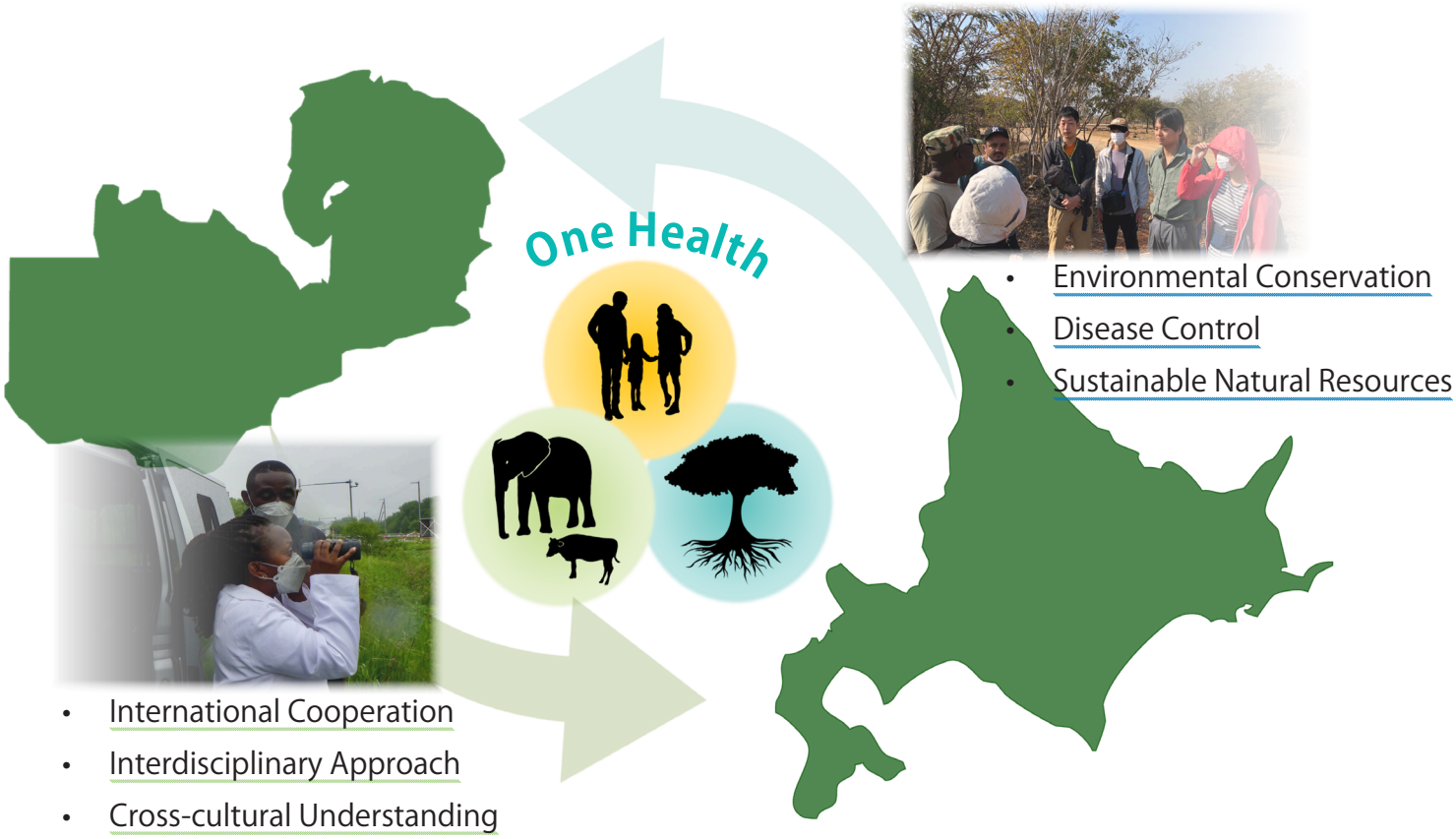
International Veterinary and Conservation Medicine Education Program [IVCMEP]

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



- Environmental Conservation
- Disease Control
- Sustainable Natural Resources

- International Cooperation
- Interdisciplinary Approach
- Cross-cultural Understanding

Past participants and almuni

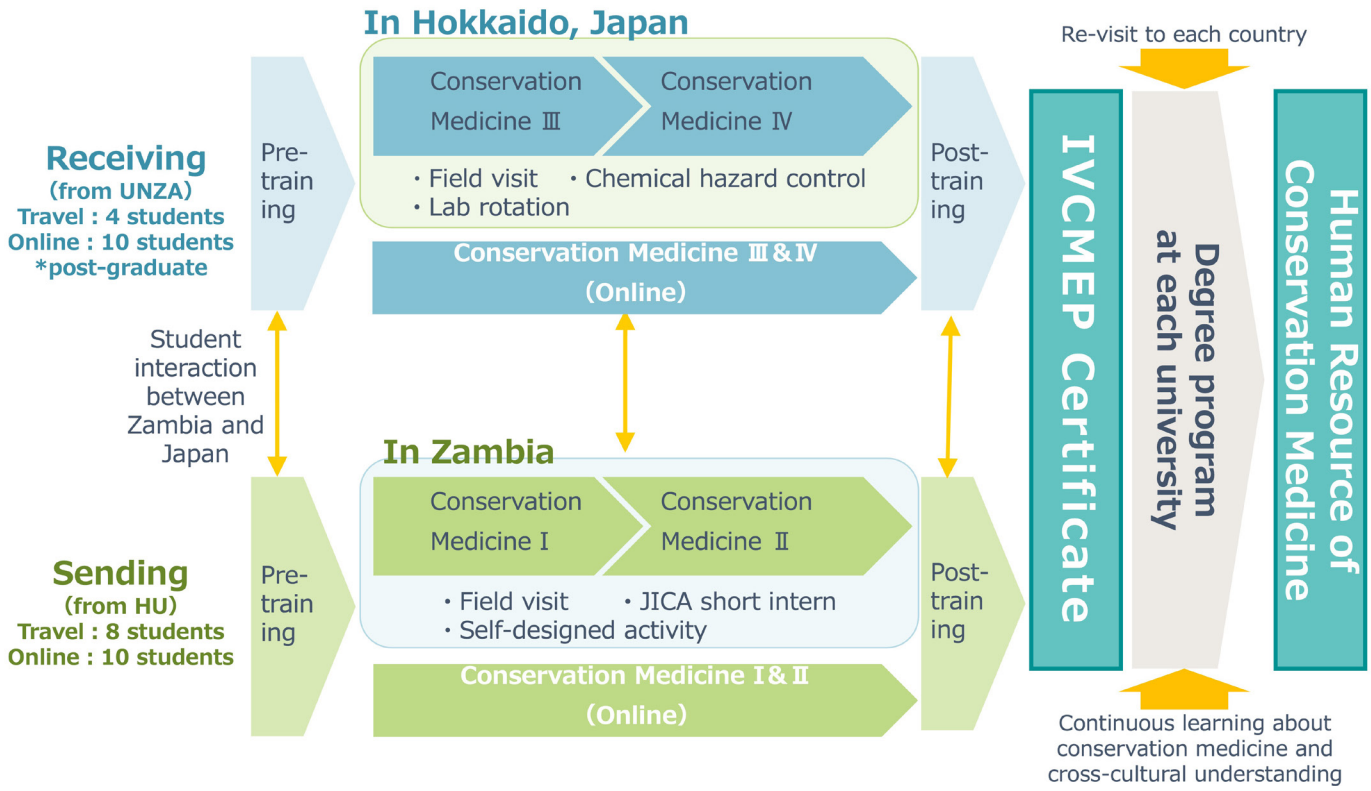
The concept of "conservation medicine" is a new academic field that has spread rapidly around the world since the beginning of the year 2000. Environmental changes caused by human activities and the associated health problems caused by infectious diseases and pollutants are issues that must be solved 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 × ZAMBIA
IVCMEP
I've come up
International Veterinary and Conservation Medicine Education Program

Cource Outline



Evaluation based on Competency and Rubric

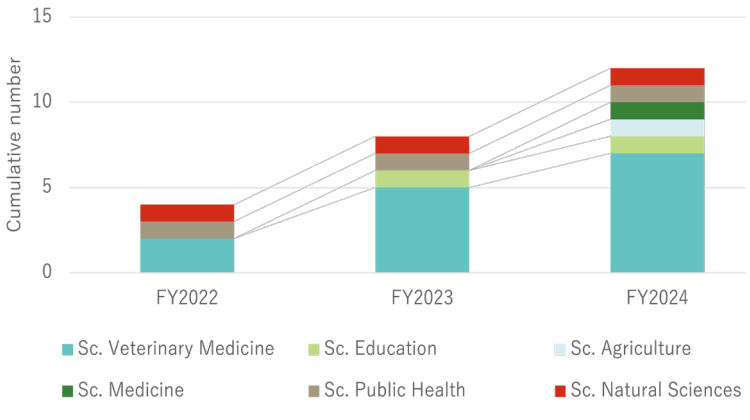
Competency is used as an evaluation index of achievement that specifically indicates the knowledge, skills, and behaviors that can be summarized in a chart called Rubric when students achieve each goal. . Students who are evaluated can understand "what behavioral characteristics were evaluated" and "which 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 2024

	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 Heath 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 them for one's problem solving.	Able to collect information from various related fields and organize knowledge.	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 smoothy 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 field of expertise in Japanese	Able to respond to daily conversation in Japanese	Able to greet people in Japanese	Cannot understand Japanese language at all

Past participants and almuni

Cumulative number of students traveled to Japan

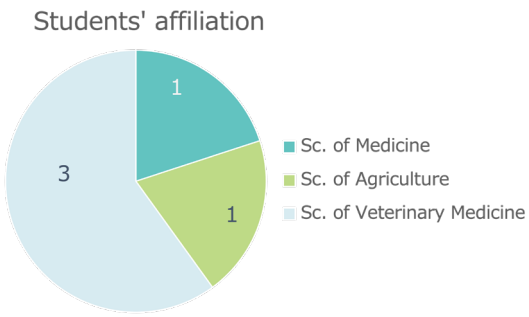


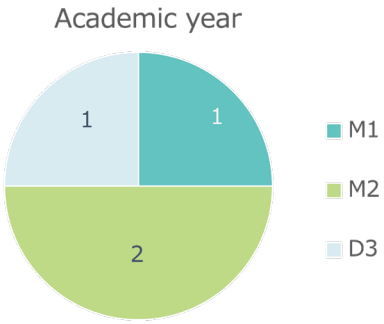
Students from various schools have participated in IVCMEP. In addition to a wide range of field exercises with a focus on conservation medicine, this program emphasizes an environment where students with different backgrounds and ideas can come together and learn from each other through semi-customized programs such as lab rotation based on personal interviews. Lab rotation offers direct mentoring from professors and introduce you with the opportunity to expand your research network.

Outline of the Program in 2024

Receiving students from Zambia

Participatns from the University of Zambia

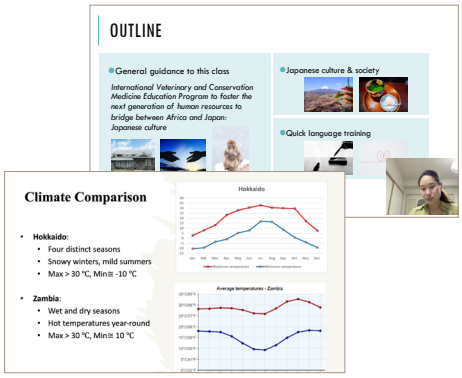




Activities in Hokkaido, Japan

Pre-training
[June - July]

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



Visiting Hokkaido
[Jul. 8 - 26]

- 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

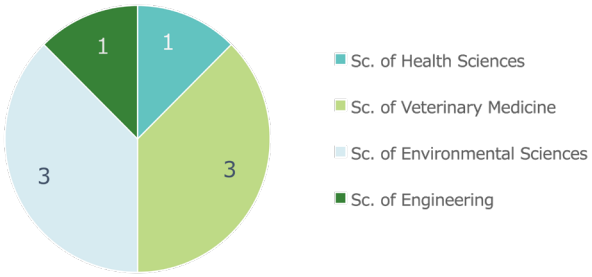
Lab Rotation at Hokkaido University

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 hygine. 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.

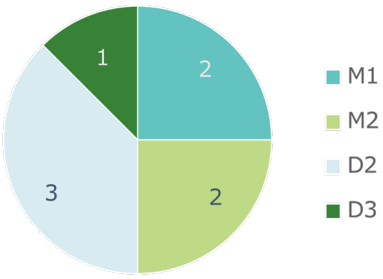
Sending students to Zambia

Participatns from Hokkaido Univeristy

Students' affiliation



Academic year



Activities in Zambia

Pre-training
[July - August]

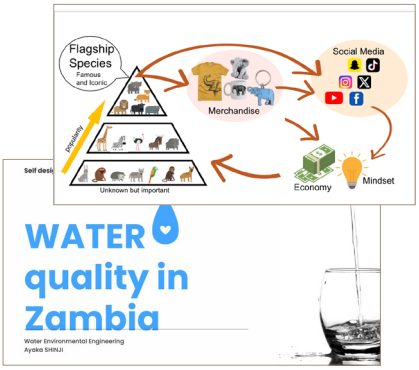
- Academic English
- Overseas risk management seminar
- JICA Zambia online seminar
- Preparation for self-designed activities

Visiting Zambia
[Sep. 7 - Sep. 24]

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

Post-training
[September - October]

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



Online Courses

Number of participants：13

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.

【 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

INDEX

Workshop on Interdisciplinary Intercultural Communication

School of Veterinary Medicine M1
Richard Haakonde

Conservation medicine is one of the popular and up and coming fields of study, also referred to as 'One Health'. It encompasses the fields of Human Medicine, Veterinary Medicine and Environmental Health. It simply deals with the sustainable interconnection and interdependence of humans, animals, and the environment. Conservation medicine is key as it emphasizes ecological conservation, and maintenance of a balance amongst humans, animals and the environment, as they are key to the ultimate sustainability and preservation of our dear planet.

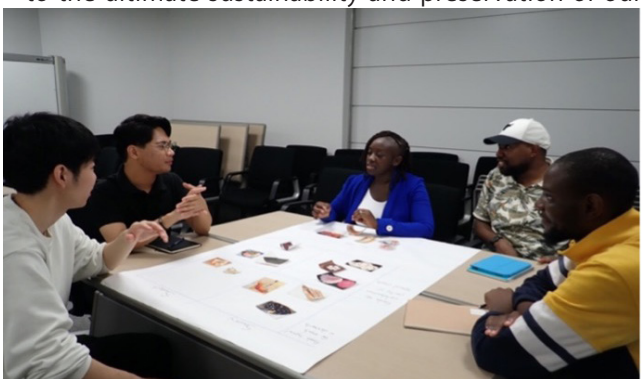


Fig.1 Food matching exercise during the intercultural:interdisciplinary workshop

The International Veterinary and Conservation Medicine Education Program (IVCMEP) offers the University of Zambia (UNZA) postgraduate students from diverse disciplines an opportunity to have a two-week unique experience in Japan learning the practical and in-depth aspects of conservation medicine and its applications. The 2024 IVCMEP program was a blend of intense in-person lectures, field trips, and two-days hands-on laboratory rotation sessions.

The 2024 IVCMEP program had 4 postgraduate students representing my UNZA for the in-person training in Japan. To kickstart the program, the highlight activity was the interdisciplinary/intercultural communication workshop facilitated by Mr. Michael James Henshaw, the English Instructor at the Graduate School of Veterinary Medicine, Hokkaido University. The workshop was attended by both Hokkaido postgraduate and undergraduate students from different study programs, besides the 2024 UNZA-IVCMEP students. This mix of attendees created an opportunity for networking and cultural exchange. The workshop focused on a discussion on food, which is an important aspect of every culture, though always overlooked. Mr. Henshaw brought with him different images of common Japanese cuisines/some images for non-food items for us to identify. We were required to do this, by either figuring out on our own or asking for guidance from the Japanese students we were grouped with. We were further required to categorize these food items identified, into specific food types where they belonged, whether they were disserts, savory foods, snacks, sweet foods, foods enjoyed during festivals, or other special events like weddings, as well as those that were non-foods.

The workshop was finally wrapped up by a demonstration on how to prepare some Japanese dishes and soups which included Onigiri (triangular/round/cylindrical shaped spiced rice balls wrapped with seaweed) and Miso soup. The Onigiri and Miso soup

Fig.2 Making Onigiri and Miso soup during the second part of the Workshop

that we made were later on shared amongst ourselves as participants.

Lecture on Introduction to Environmental Toxicology

School of Veterinary Medicine M1

Richard Haakonde

On 8th July 2024 in the afternoon we had a first lecture on, "Introduction to Environmental Toxicology". The lecture was given by Dr Andrew Kataba (PhD, MSc. VAP, BVM) at Hokkaido University. During the lecture, we learnt that environmental toxicology is a science that deals with the study of the effects of pollutants on the environmental ecological systems. It was appreciated that these pollutants among others included industrial, agricultural and household chemicals such as pesticides, insecticides, and herbicides. Dr Kataba went further to share key global statistics about environmental toxicology. He mentioned that about 310 kg of toxic chemicals is released into the environment per second globally, which translates into an annual release of over 10 million tonnes of toxic substances, with 2 million tonnes of these substances recognised as carcinogens. These records are as per reports from Worldmeters and Environmental Health Reports.

The lecture provided an in-depth insight analysis into the impact of pollutants on the ecosystem and human health. The complex interactions between pollutants and biological systems was emphasized, highlighting the bioaccummulation and biomagnification of toxic substances within foods chains. Key takeaways comprised the importance of monitoring pollutants, the role of legistration in mitigating environmental risks, and the importance of public awareness, and education. Strict environmental regulations to control pollution was discussed as one of the key points practised by developed countries. It was further discussed that stringent standards to minimize the release of hazardous materials into the environmen were key. In contrast, many developing countries, Zambia inclusive, were noted to struggle with insufficient environmental regulatory frameworks, and enforcement, leading to higher levels of pollution and associated health risks.

When compared to Japan, specifically Hokkaido Prefecture, Zambia's situation on environmental control, the differences were noted to be evident. Hokkaido being a part of a highly developed country, Japan, it was noted to have rigorous pollution control measures. It was noted that Japan's environmental management and control approaches involved detailed and close monitoring systems, advanced waste treatment technologies, and active public participation in environmental protection initiatives. It was appreciated that these efforts resulted in Japan having significantly lower pollution levels as well as a cleaner environment.

On the the hand it was shared that Zambia still had challenges in environmental management due to insufficient resources, weak enforcement of environmental regulations, and that it to some extent lacked public awareness and mindset change towards environmental protection. It was also noted that industrial activities mainly mining immensely contributed to Zambia's environmental degradation. Irrespective of the many existing laws, the implementation of pollution control measures remained illusive in Zambia, leading to adverse effects on the ecosystem.

In conclusion, the lecturer highlighted the critical need for effective environmental management management, and mentioned that developed nations serve as role

Fig.1 Dr Andrew Kataba (PhD, MSc.VAP, BVM) giving a lecture on environmental toxicology and food toxicology to Hokkaido and the 2024 UNZA – IVCMEP postgraduate students

models for developing countries like Zambia with regards to environmental protection. Strengthening of collaborations using the One Health approach which IVCMEP pioneers, was found to be key in solving the many conservation challenges our planet is currently faced with.

Lecture on Food Toxicology

School of Veterinary Medicine M1
Richard Haakonde

The second lecture was on , "Food Toxicology" and it was started by re-echoing the famous Hippocrates' Principle: "Let food be thy medicine and medicine thy food", a statement recorded over two millenia ago. Dr Kataba resounded this Hippocrates' call, as he continued with the second session of the two afternoon lectures that were panctuated by a 10 minute break. He went further to introduce the lecture by defining food toxicology as the science that studies substances in food that may cause harm when consumed, including their environment, properties, effects, and exposure. He stressed that the key components of food toxicology comprised detection, characterization, assessment of effects on the body, and investigation of adverse side effects.

It was appreciated that some chemical contaminants in food were often unavoidable and could come from natural or ubiquitous sources. The potential sources included; microbiological contamination, environmental contamination (pesticides, heavy metals etc), changes during cooking/processing, packaging migration, intentional addition (food additives), industrial pollution and novel foods. It was mentioned that microbiological contaminants included pathogens such as Clostridium botulinum, Salmonella spps, and Escherichia coli (E.coli). It was further appreciated that these pathogens were the significant ones with regards to food safety, however, it was noted that emerging infections posed new risks. The lecturer highlighted that the most common environmental contaminants of food included heavy metals notably mercury, and cadmium, and pesticide residues, and these posed health risks, with long-term exposures leading to severe outcomes such as cancer or neurological disorders.

Fig.1 Dr Kataba (PhD, MSc VAP, BVM) delivering a lecture on food toxicology as the 2024 UNZA – IVCMEP postgraduate students are looking on

It was interesting to learn that some modern food safety concerns included food additives like Monosodium Glutamate (MSG), artificial sweetners and preservatives (e.g. Sodium Nitrite), which equally posed potential health risks. It was mentioned that industrial pollution such as Polychrorinated Biphenyl (PCB) contamination, and radioactive fallout, had led to historical food safety crises. Novel foods were clarified as foods including genetically modified foods, and that nanotechnology introduced new safety challenges, though generally found safe under strict control regulations. It was lastly mentioned that some natural toxins included certain plants and animals which contained inherent or induced natural toxins, posing risks to human health.

In conclusion the lecturer mentioned that just like with environmental toxicology, more stringent measures (food safety measures) including prudent food safety policies, legislation, and their associated enforcement were key to ensuring food safety. Looking at the advanced food safety policies of Japan and their strict implementaion resulting in close to almost no reported food poisoning incidents, it was mentioned that a lot could be learnt by Zambia for the improvement of its food safety situation.

Lecture on Genetic analysis / DNA & RNA analysis

School of Veterinary Medicine M2
Stephano Simbiti

On 19th July 2024, we had Lectures and practical sessions on Genetic Analysis instructed by Dr. Mitsuki KONDO from the Faculty of Veterinary Medicine, Kagoshima University, these lectures

aimed at enhancing our knowledge and skills, particularly in the analysis and utilization of genomic data. We covered several subtopics including (i) introduction to NGS, Bioinformatics, and its application

(ii) utilization of genome NGS database and Blast (iii) Molecular Phylogenetic analysis (iv) RNA and DNA seq Analysis

On the first day, we had an introductory lecture on NGS and Bioinformatics, briefly, we learned that Bioinformatics is a computer-based tool for genomic data analysis, while NGS is a technology used to determine the order of nucleotides in entire genomes or targeted regions of DNA or RNA at ultra-high throughput, scalability, and speed. for example, The T2T human genome sequence was completes at short time using NGS. NGS currently has been utilised in many fields such as medical research, comparative biology/genome, population genomics, toxicology/ eco-toxicology. During the lecture we familiarized ourselves on different databases where sequences can be deposited, these are NCBI, GenBank, Ensembl, DDBJ, CNGB that are utilized by researchers. We had a practical session on molecular phylogenetic tree construction to understand and estimate molecular evolution relatedness of organisms using sequences using MEGA software to construct the phylogenetic tree of CYP2B6 gene for dog, human and cat,

We also have have the opportunity to learn about the ongoing current NGS projects in the world for plants, fish, reptiles, amphibians, birds, and mammals including Zoonomia, Africa Bio-genome project, Genome 10K.

On the second day, We had a lecture on the Utility of RNAseq/DNAseq. RNA seq analysis at the transcription level to identify genes that are highly expressed, differently expressed, and even changes of functional groups.

Workshop on GIS and Ecology

School of Agriculture D3
Natasha Mwansa

Geographic Information Systems (GIS) training was conducted by an NGO called EnVision Conservation Office with a particular focus on using ArcGIS software. This training covered essential aspects of geospatial analysis which provided the team with skills to manage and analyze spatial data. We learned how to input, manipulate and visualize geographic information which is widely applicable across various fields, including environmental monitoring, veterinary medicine, agriculture sciences and disaster management to mention a few. We learned how to create detailed

Fig.1 Creating Arc GIS Online Accounts

maps and conduct spatial analyses that combine multiple data layers to assess patterns and trends in geographic phenomena. The training also included practical applications of ArcGIS tools for analyzing large datasets, making it a versatile skillset for handling complex spatial problems in real-world scenarios. Through this experience, we became proficient in geospatial techniques which will enhance our ability to work on multidisciplinary programmes that require an understanding of spatial data in diverse contexts.

Visit to Toyoha Mining and Treatment Plant

School of Agriculture D3
Natasha Mwansa

Lecture

The day began with a lecture on water treatment and environmental remediation at the School of Engineering by Professor Park. The lecture focused on advanced techniques used to treat water contaminated by industrial activities, particularly mining operations. We gained a deeper understanding of the methods used to mitigate the environmental impact of mining, including chemical treatments, bioremediation and

Fig.1 Lecture on Environmental Pollution and Remediation by Professor Park

Fig.2 Students examining sludge cake at the Waste Water Purification Plant

the use of filtration systems to purify water. The lecture also covered the importance of sustainable practices in mining such as preventing pollutants from entering nearby water sources and ensuring the long-term health of ecosystems affected by mining operations.

Site Visit

Following the lecture, we visited the Toyoha Mining and Treatment Plant, where we observed the water treatment and remediation techniques in action. At the mine site, we were introduced to the processes involved in treating contaminated water before its release into the environment. This included touring the water treatment facilities where technologies like sedimentation tanks, chemical treatments and filtration systems are employed to remove heavy metals and other pollutants from the water. It was interesting to learn about the mine's efforts to remediate areas affected by mining operations and their strategies for soil restoration and ecosystem recovery.

The visit provided us with a practical perspective on the challenges of managing environmental impacts in the mining industry and highlighted the importance of integrating engineering solutions with environmental stewardship. The experience also broadened our understanding of water treatment and remediation which are key areas that are critical not only in mining but also in various industries that seek to minimize their ecological footprint.

Visit at Kushiro Shitsugen Wildlife Center / IRBJ

School of Veterinary Medicine M2
Stephano Simbiti

On 12 July 2024, we visited the Kushiro-Shitsugen Wildlife Center that runs the Institute for Raptor Biomedicine. During the visit, Dr. Yukiko Watanabe (vice-president and Veterinarian) delivered a lecture on endangered bird species (Steller's sea eagle, white-tailed eagle, and Blakiston's fish owl), their habitat, injury, rescues, and rehabilitation, management/treatment and release programs. It was important to learn the main activities of the IRBJ, which are mainly centered on the protection and conservation endangered bird species. The activities include (i)Rescue of endangered species from different parts of Hokkaido. The main causes of injury/death for bird species are traffic accidents (34%), other unknown cause-32%, Lead poisoning-23%, collision of wind mill-1% and electrocution-10%, predated accidents of juvenile and sometimes net/ drowning in blakston`s fish owl. Identifying these causes helps out in planning conservation efforts targeting preventive measures, (ii)Transport to the wildlife center, injured, sick or dead individuals are retrieved and transported to the Kushiro Shitsugen wild center, sometimes the birds are transported by a relay system, and birds can receive treatment while transported to WLC. (iii)Treatment/determination of cause: Birds are examined clinically and an autopsy is done to determine the cause of illness/or injury this determines the treatment/management option to be taken and also helps the conservation efforts

(iv)Pre-release training/ returning to the Wild: After recovery from the injury/ sick birds expected to be released undergo pre-release training of hunting and flying. Fit birds are released while tagged with ring and GPS tracking devices. (v) Public awareness, Communication, and Education: Birds that are lifelong captives are not released due to permanent damages, instead they play an important role in helping to rehabilitate others, providing environmental education, and in developing equipment to prevent future

Fig.1 Lecture at the institute of raptor management

accidents. e.g., Observers can see how they behave in a display enclosure and sometimes they serve as training partners during practical courses for government administrators, veterinarians, and Students, they also serve as donors for blood transfusion to severe anemic birds, or to birds undergoing surgery when large blood loss happens. (vi)Verification experiments and Installation of preventive devices: The IRBJ also studies the mechanism that causes electrocution. birds, monitor how raptors perch on the electric transmission, design and test objects with variety of colors and shapes that are installed to prevent birds from electrocution thus reducing the number of accidents. also, in an effort to reduce traffic accidents, the institute has been installing poles on the bridge railing and devices to prevent perching.

We also visited the LWC Museum and we saw and appreciated the skeletons for endangered birds, bird listening sounds, white-tailed eagle breeding, owl breeding nests, and eggs. Alos at the backyard we observed different birds undergoing rehabilitation/ treatments and appreciated the actual size and weight of these birds at the enclosure display. Lastly, we visited the LWC Veterinary clinic to see different equipment and instruments used for the medical care and treatment of rescued, injured, and necropsy birds

Fig.2 Bird observation at rehabilitation unit

Fig.3 Observation of different electrical equipment design to prevent electrocution

Shiretoko Goko Lakes Field Visit

School of Veterinary Medicine M1
Richard Haakonde

On 13th August 2024; while in Shiretoko - Shari we had an opportunity to visit the Shiretoko Goko Field House. At the field house we had a talk from the tour giude Mr. Richard Forrest, about the geographics of the Shiretoko Goko Lakes, the activities one could angage in at the field house and how to keep safe incase of Brown Bear encounters/attacks. Dr Michoto Shimozuru from the Hokkaido Wildlife Laboratory, also came in to help in answering questions especially those with regards to wildlife (such as Brown Bear behaviours and population control of Sika Deers). After the talk we watched a short video that supplemented the information from the talk Mr Forrest gave.

In summary the activites the Field House comprised a 40 minute leisure stroll on the 1.6 km elevated wooden path, as well as a walk along the short and long ground pathways. It was clarified that the walk on the elevated wooden path, gets one to view the beautiful Shiretoko mountain range reflected on lake Ichiko when the weather conditions are favourable. It was mentioned that the wooden path had three observation decks including; the mountain range observation deck, the Okutsuku observation deck and the lakeside observation deck. We also got to learn that one could only view lake Ichiko, one of the five goko lakes, from the elevated wooden path. It was mentioned that the other four lakes could only be viewed when one takes the ground pathways. These four lakes included lake Niko, lake Sanko, lake Yonko and finally lake Goko. Between the two ground pathways, one could only view all the five lakes along the long ground pathway. On this long ground trail it was explained that visitors get a chance to appreciate the fauna and flora of the Shiretoko lakes including bird species such as the Mallard, Grebe, Black wood-pekker, Narcissus flycatcher, and the Great spotted wood-pekker; the animal species included the Hokkaido squirrel, Sika deers, and also that there was a very high chance of seeing a the Brown Bears.

During our visit we only had a chance to take a leisure stroll on the elevated wooden path. We enjoyed the view of the breathtaking lake Ichiko we viewed mostly from the Lakeside observation deck. Unfortunately,

Fig.1 Lake Ichiko and the Elevated Wooden Path of Shiretoko

Fig.2 Two of the 2024 UNZA IVCMEP Students on the Elevated Wooden Path of Shiretoko and side view of the wooden path

due to the the cloudy weather condition we didn't manage to see the Shiretoko mountain range reflected on lake Ichiko. The binoculars provided by our IVCMEP coordinators came in handy for our viewing activity of the beautiful nature and birds we were surrounded with. It must be mentuoned that the feel of the of the freshing air breeze, and an overwhelming sight of nature in Shiretoko especially the Goko lakes area was not only therapeutic but also refeshing, giving the much needed dose of the mental health elixir for the stress accumulated during the long road trip from Sapporo to Shiretoko -Shari.

The lessons learnt from this part of the field visit included the importance of safeguarding the natural heritage sites, and finding ways on how to fundraise for these nature spots. This was appreiciated as one of the ways to create employment for the locals, at the same time providing a safe, tranquil and serene spot for both local and international tourists. It was noted that the Shiretoko Goko Lakes Field House was a favourite tourist destination especially for those who would want to take a break from the hustle and bustle of the big cities, a safe haven for those keen keep their mental health in check. It was appreciated tha having facilities like the Shiretoko Goko Lakes also contributed to the conservation efforts of wildlife and the environment, as well as serving as an education centre to the general public about wildlife/nature conservation and prevention of human animal (Bear) conflicts. Zambia could emulate the Shiretoko conservation model, for its abundant national parks, national heritage sites, and wildlife.

Shiretoko National Park

School of Medicine M2

Chibwe Shumbwa

Introduction

The Shiretoko national park visit was one of the most interesting highlights of the visit to Hokkaido, Japan. The national park was founded in 1964 and recognized as a world heritage site in 2005. The students travelled from Sapporo to Shari, where Shiretoko national park is found, on Friday 12th July 2024 and spent Saturday 13th July touring the national park and the 14th on a boat cruise before travelling back to Sapporo. Other activities included lectures about the national park, forest trekking, the goko lakes visit, and a cultural exchange night on the 13th of July 2024.

Shiretoko lecture

The national park rangers gave a lecture on the human bear conflict and the measures that they have put in place to safeguard the bears and the human community including an electric fence that keeps bears within the national park. After the lecture, the rangers took the students around the conservation centre and taught the students about the work that the conservation centre does in conjunction with its partners, among which are Subaru and the North face. The students also got the opportunity of watching a movie that showed the dangers of feeding bears and the impact of human bear interaction. I had never really thought about how much of a danger that humans can be to wildlife other than the occasional threat that poachers pose to animals. However, after this movie and my interaction with the park rangers, I learned that even well intentioned activities like giving wildlife food can actually be dangerous to them as they get accustomed to food and in turn start to stray into human habitats in search of food. This in turn leads to human animal conflict because the wildlife then pose a threat to human life and have to be killed because of that. I will definitely

Fig.1 Photo taken during lecture where the ranger was explaining the physical barriers that the national park

Fig.2 The Zambian students interact with one of the rangers as he explains more about the work he does at the conservation centre

think twice before feeding a monkey or an elephant next time I am visiting a national park in Zambia.

Personal Insight

In Zambia, human-wildlife conflict often involves elephants or lions. Seeing Japan's proactive measures inspired me to advocate for similar strategies back home. The collaboration with companies like Subaru and The North Face also highlighted how global partnerships can amplify conservation efforts.

Forest trekking

The Zambian students took a nature walk in the national park with a ranger who taught them about the history of the forest and the current efforts the conservation is doing to increase the forest plant diversity. Just before the students entered the forest, there was a bear that was sighted along the trail but thanks to Shimozuru sensei, a bear expert, the forest nature walk was able to continue. The team was shown the house of two of the pioneers of the forest.

Trekking through the forest, I could not help but be amazed by the enormous trees and the efforts by the national park to replant indigenous trees in the forest. Visiting the houses that the pioneers lived in was like going back in time. It is quite amazing that the park decided to repurpose the houses instead of demolishing them.

Fig.3 The ranger takes time to explain how the conservation centre is working to diversify the tree species in the national park

Personal Insight

The forest's biodiversity reminded me of Zambia's Miombo woodlands, yet Japan's focus on replanting native species struck me. I realized how reforestation could combat climate change in Zambia, where deforestation remains a challenge.

Cultural exchange night

On the last night of the trip, the national park rangers were invited to an event where the Zambian students cooked an array of traditional Zambian meals and their Japanese hosts also cooked a Japanese meal. During the meal, there was a lot of interaction between the Zambian students, the national park rangers and the hosts. It was a very memorable night as many light moments were shared and there was a lot of cultural exchange as the groups learned a lot of valuable insights about each others culture that they would otherwise never have learned.

There is a lot to learn about different cultures and the easiest way to do so is through food. Different cultures have different food eaten on different occasions. While in Zambia, we are slowly losing this part of our culture, I was amazed to find it very much alive in Japan; our hosts were able to explain what each article of food meant and the occasions for its use. The cultural exchange night was one of the most enjoyable moments for me because I got to enjoy the hospitality of our hosts and also had an opportunity to share Zambian food with people who otherwise may never have gotten a chance to taste it.

Fig.4 A photo showing some of the food eaten during the cultural exchange night. In the centre of the picture is a bowl of brown mushroom from Zambia.

Personal Insight

Food truly bridges cultures. A ranger admitted he'd never tasted African food, calling our bowa "exotic." Meanwhile, I learned that Japanese

meals emphasize balance—a lesson I'll carry home.

Boat cruise

The final activity before leaving Shiretoko was a boat cruise on the pacific ocean. The students were taken to the northern most tip of the island, known as the cape Shiretoko where they saw the cape Shiretoko light house. During the boat cruise, the students sighted a brown bear and a white tailed eagle. The boat crew were extremely kind and friendly and shared some candy with us. It really was an amazing experience.

The boat cruise was a dream come true. This was my first time visiting the pacific ocean and just touching the water was a little surreal. Lifting the Zambian flag high up on the ocean, and so far away from home was incredible and reminded me of the strong ties that Zambia has with Japan and how this trip would no have been possible if not for the strong bilateral ties that exist between the two countries and between the University of Zambia and Hokkaido University.

Personal Insight

The cruise mirrored Zambia's Zambezi River safaris, yet Japan's marine biodiversity amazed me. The crew's kindness—sharing candies and stories—reminded me of the universal language of hospitality.

Fig.5 Sighting of the white tailed eagle. One of the Zambian students can be seen looking through the binoculars

Conclusion

The trip to Shiretoko National park was more than just a visit to a park; it was a lesson in humility, coexistence, and cultural curiosity. The lessons I learned from this visit will forever remain with me and will influence my outlook on life, nature and the environment. Japan's ethos of harmony with nature and a renewed commitment to conservation is something worth admiring. Arigatou gozaimasu, Hokkaido!

This experience was made possible by the IVCMEP program and Hokkaido University's unwavering support.

Fig.6 The Zambian students hold up the flag of Zambia during the boat cruise in the back ground as the rest of the team members pose for the photo


シマフクロウ
学名: Ketupa blakistoni
英名: Blakiston's fish owl


大学院獣医学研
大学院獣医
大学院国際感染症学

Report on Lab Rotation

INDEX

Division of Bioinformatics of the International Institute for Zoonosis Control

School of Veterinary Medicine M1
Richard Haakonde

On 18th July 2024, I had the privilege of having a hands-on training at the International Institute for Zoonosis Control, Division of Bioinformatics, with Professor KIMIHITO Ito. Professor Ito introduced me to Comparative Toxicogenomics Database (CTD), an open access database aimed at advancing the understanding of the effect of environmental exposures on human health. I learnt that CTD provided information on chemical-gene, chemical-protein interactions useful for drawing chemical-disease, and gene-disease relationships. Professor Ito stressed that the database contained functional and pathway data as well.

After navigating through the database, I appreciated how CTD could be a very useful tool for researchers in coming up with hypotheses about development of diseases resulting from environmental exposures to toxic substances. I also noted that the database contained exposome data (measures of all exposures of individuals for a lifetime and how the exposures relate to health) outlining chemical-phenotype/disease relationships. Professor Ito lastly helped me identify and differentiate curated and inferred data contianed in the database.

The summarized statistics for the CTD database obtained were as shown in the table below: -

As my research interest is focused on investigating the ameliorative effects of plants against heavy metal toxicity, we looked at Lead (Pb) and Mercury (Hg) concentrating on the genes affected by each of these metals as well as, the intersection genes affected by both metals. We deduced throug the use of the database that Pb interacts with a total of 3,446 genes, the top 10 genes being CYP1A1, TNF, MT1, CAT, ALAD, CASP3, MT2, APP, HMOX1, and PTGS2. Using CTD we also discovered that Pb was associated with 171 diseases with direct evidence, the top 8 diseases being autistic disorder, autistic spectrum disorder, lung neoplasms, obesity, intellectual disability, diabetes mellitus type 2, arthritis (rheumatoid), and myocardial ischaemia. A total of 4211 diseases were inferred to be associated with Pb exposure. Below is an excerpt of the database showing diseases, and the number of genes associated with Pb poisoning: -

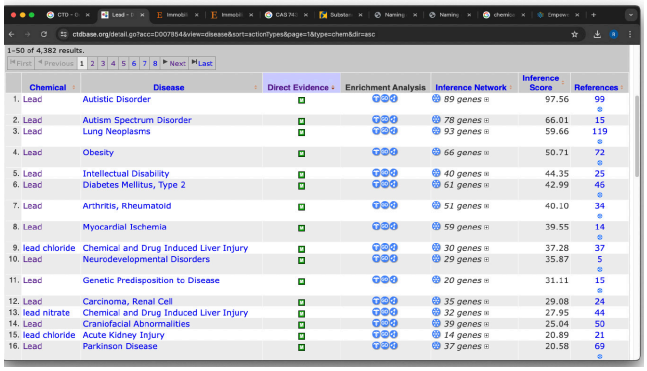
Interactions	Chemical - Gene	Gene-Disease	Chemical-Disease
Unique Chemicals	14,923	-	10,504
Unique Genes	55,359	9,096	-
Unique Disease	-	5,853	3,308

Table 1. The number of registered entities

	Chemical	Gene	Disease
Chemical	-	2,945,493 /826,122,357	3,499,126/34,747,232
Gene	2,945,493 /826,122,357	-	32,875,121/53,238,888
Disease	3,499,126/34,747,232	32,875,121/53,238,888	-

**The number after slash indicate the number of possible interactions between entities.*

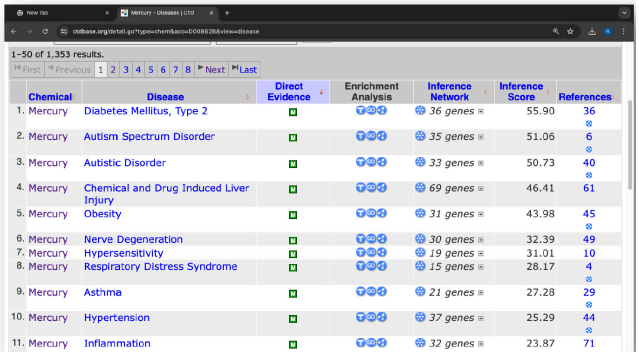
Table 2. The number of registered interactions



1-50 of 4,382 results.

	Chemical	Disease	Direct Evidence	Enrichment Analysis	Inference Network	Inference Score	References
1.	Lead	Autistic Disorder			89 genes	97.56	99
2.	Lead	Autism Spectrum Disorder			78 genes	66.01	15
3.	Lead	Lung Neoplasms			93 genes	59.66	119
4.	Lead	Obesity			66 genes	50.71	72
5.	Lead	Intellectual Disability			40 genes	44.35	25
6.	Lead	Diabetes Mellitus, Type 2			61 genes	42.99	46
7.	Lead	Arthritis, Rheumatoid			51 genes	40.10	34
8.	Lead	Myocardial Ischemia			59 genes	39.55	14
9.	lead chloride	Chemical and Drug Induced Liver Injury			30 genes	37.28	37
10.	Lead	Neurodevelopmental Disorders			29 genes	35.87	5
11.	Lead	Genetic Predisposition to Disease			20 genes	31.11	15
12.	Lead	Carcinoma, Renal Cell			35 genes	29.08	24
13.	lead nitrate	Chemical and Drug Induced Liver Injury			32 genes	27.95	44
14.	Lead	Craniofacial Abnormalities			39 genes	25.04	50
15.	lead chloride	Acute Kidney Injury			14 genes	20.89	21
16.	Lead	Parkinson Disease			37 genes	20.58	69

Fig.1 Excerpt of CTD database showing diseases and genes associated with PB



1-50 of 1,353 results.

	Chemical	Disease	Direct Evidence	Enrichment Analysis	Inference Network	Inference Score	References
1.	Mercury	Diabetes Mellitus, Type 2			36 genes	55.90	36
2.	Mercury	Autism Spectrum Disorder			35 genes	51.06	6
3.	Mercury	Autistic Disorder			33 genes	50.73	40
4.	Mercury	Chemical and Drug Induced Liver Injury			69 genes	46.41	61
5.	Mercury	Obesity			31 genes	43.98	45
6.	Mercury	Nerve Degeneration			30 genes	32.39	49
7.	Mercury	Hypersensitivity			19 genes	31.01	10
8.	Mercury	Respiratory Distress Syndrome			15 genes	28.17	4
9.	Mercury	Asthma			21 genes	27.28	29
10.	Mercury	Hypertension			37 genes	25.29	44
11.	Mercury	Inflammation			32 genes	23.87	71

Fig.2 Excerpt of CTD database showing diseases and genes associated with Hg

Secondly, we looked at Hg and discovered that it interacts with 651 genes with the top 10 being CYP1A1, HMOX1, NQO1, TNF, IL6, NFE2L2, ABCC2, CAT, GSTP1 and IFNG. A total of 86 diseases were shown to be associated with Hg with direct evidence. The top 8 diseases included diabetes mellitus type 2, autism spectrum disorder, autistic disorder, chemical and drug induced liver injury, obesity, nerve degeneration, hypersensitivity, and inflammation. A total of 1267 diseases were inferred to be associated with Hg. Below is an excerpt of the database showing diseases and the number of genes associated with Hg poisoning: -

Conclusion

The hands-on training at the International Institute for Zoonosis Control's Division of Bioinformatics provided important insights into the Comparative Toxicogenomics Database (CTD) and its applications in toxicological and environmental health research. The exploration of CTD revealed a vast collection of curated and inferred data on chemical-gene, gene-disease, and chemical-disease interactions, as well as exposome data. This increased its utility in formulating hypotheses about diseases development caused by environmental exposures. An in-depth investigation of lead (Pb) and mercury (Hg) interactions with genes and diseases found unique toxicity patterns. Pb was discovered to interact with 3,446 genes and was directly linked to 171 disorders, including autistic spectrum disorder, lung neoplasms, and type 2 diabetes. Similarly, Hg was linked to 651 genes and 86 diseases, with notable associations to metabolic disorders and neurodevelopmental issues. Additionally, the overlapping genes affected by both metals point to common biological pathways that are possibly involved in toxicity. The capacity of CTD distinguish between curated and inferred data adds to its credibility as a research tool. Overall, the exercise emphasised the importance of bioinformatics in toxicology by illustrating how large-scale databases may be used to better understand chemical exposures, gene associations, and the implications for human health. The knowledge gained during this session will be useful in guiding future research into the protective properties of medicinal plants against heavy metal poisoning.

Faculty of Veterinary Medicine
Department of Environmental Veterinary Sciences
Laboratory of Toxicology

School of Veterinary Medicine M1
Richard Haakonde

On 19th July 2024 the second day of the hands-on laboratory rotation exercise, I spent time in the department of Environmental Veterinary Sciences, Toxicology Laboratory, faculty of Veterinary Medicine, at Hokkaido University. During the laboratory rotation exercise Ms. Rio Doya (DVM) a researcher and one of the IVCMEP coordinators took me through an experiment on Reverse Transcription Quantitative Polymerase Chain Reaction – (RT-qPCR). Ms. Doya introduced RT-qPCR as a laboratory technique for

Fig.1 2024 IVCMEP student performing RT-qPCR on chicken samples expose to Pb

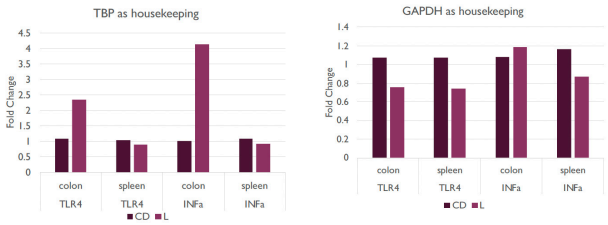


Fig.2 Summary of qPCR Results

amplification and quantification of Deoxyribonucleic Acid (DNA) sequences, which involves converting Ribonucleic acid (RNA) complementary DNA (cDNA) by reverse transcription followed by amplification and quantification of the cDNA using real-time PCR. Dr Doya emphasized that RT-qPCR was key for measuring gene expression, through detection and quantification of specific RNA molecules.

We thereafter analysed chicken samples which included colon, and spleen tissues of 6 chickens exposed to a single dose of Pb (L1, L2, L3, L4, L5, L6) and another 6 chickens belonging to the control group treated with Double Distilled Water (CD1, CD2, CD3, CD4, CD5 and CD6). The exercise was aimed at investigating the effect of Pb on the expression of target genes comprising Toll-Like Receptor-4 (TLR-4) and Interferon alpha- (INF*α*). The house keeping genes used included Glyceraldehyde-3-Phosphate Dehydrogenase (GAPDH) and TATA-Binding Protein (TBP). After analysis of the samples the following results were obtained: -

As seen from the results, it was observed that Pb showed no effect on the expression of the target genes TLR4 and INF*α*. However, this result could be due to the exposure being single dose only. It was also noted that since the result tendency differed among two sets of the results based on the different selected house-keeping genes which could have needed reconsideration. Interestingly on the other hand when reference was made to the CTD database, it was clear that the target genes analysed during RT-qPCR exercise (TLR4 and INF*α*) were not among the top 10 genes affected by Pb, supporting the results obtained in this experiment.

Conclusion

The laboratory rotation in the Department of Environmental Veterinary Sciences, exposed me to reverse transcription quantitative polymerase chain reaction (RT-qPCR), a critical method for examining gene expression. The investigation aimed to investigate how Pb exposure altered the expression of IFN*α* and TLR4 in chicken colon and spleen tissues. The data revealed that a single dose of Pb did not have a substantial influence on the expression of these targeted genes. However, changes in housekeeping gene selection led results to differ, implying that future experiments should be properly normalized. TLR4 and INFα did not rank among the top Pb-affected genes in the CTD database, supporting the observed findings. These findings indicate that a single dosage exposure may not be adequate to generate detectable changes in these genes, and that a longer or recurrent exposure may be required to observe substantial gene expression changes. This work demonstrated the significance of combining bioinformatics technologies with laboratory research to validate experimental results. Cross-referencing laboratory data with curated databases such as CTD improves findings dependability and aids in the refinement of research methods. Further research employing prolonged exposure models and new target genes will be critical in better understanding Pb toxicity and uncovering potential protective mechanisms via plant-derived chemicals.

Laboratory report at the Institute of Vaccine Research and Development (IVRED)

School of Veterinary Medicine M2
Stephano Simbiti

Lab rotation

On the 18th I visited the IVRED laboratory where I met my Lab supervisor Dr Gonzalez Gabriel, who introduced me to the director of IVRED, Prof. Sawa Hirofumi, and other institute staff. I had a prior conversation with Dr Gonzales on which topic to work on during my visit to Hokkaido University. Two topics were suggested, (i) to conduct big data analysis to find correlations between the number of sequenced cases with weather

Fig.1 IVRED laboratory building at Hokkaido University

Fig.2 PCR procedures at IVRED

conditions in the season using each geographical region (or country) as separate observation areas, and (ii) the sequencing of adenovirus B3 to get complete genome sequencing using the inexpensive Next Generation Sequencing protocols of Oxford Nanopore Technologies. During the Laboratory rotation, we worked on the sequencing of the Adeno B3 virus since I had an interest in sequencing which aligns with my current research.,

Upon reaching the Laboratory, I had an introductory lecture on the background of adenovirus B3 and a designed new protocol. The protocol involved using Multiplexed set (pooled) primers in the sequencing of Adenovirus B3 to get complete genome sequencing using the inexpensive Next Generation Sequencing (NGS)protocols of Oxford Nanopore Technologies (ONT) to understand Viral transmission and dynamics.

The use of multiplexed primers with ONT Rapid Library Kit allows a faster, simpler, and less expensive AdenoVirusB3 sequencing: Our experiments involved the steps listed below:

At first, Primer's concentration for each Primer 1 & 2 was calculated and the primers were pooled, Preparation of the Master mix using the primers (pol 1 and 2) and PCR amplification were run for 1hr and 29 minutes at 56℃ for 10 min, 35 cycles for 95℃ for 10s, and 55℃ for 40s. PCR product purification using KAPA Hyperpure-Beads (>200 bp) and quantified using EzDrop Spectrophotometer (36.95ng/µL)

Secondly. Oxford Nanopore Technologies Sequencing was done using Rapid Sequencing Kit V14(SQK-RAD114), after DNA library and flonge expansion (EXP-FS001) preparation. The flonge flow was loaded to the minion, followed by Sequencing through the MinKNOW software in the computer. The sequencer ran for 48 hours. After 48hrs we obtained almost 80% of the sequences

Results

after 48 hours of sequencing we obtained good coverage as shown in the graph below, Bioinformatic analysis is still going on

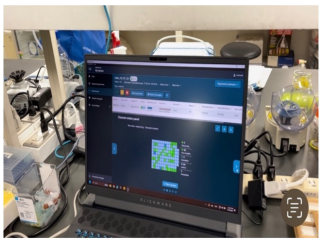


Fig.3 ONT sequencing at IVRED

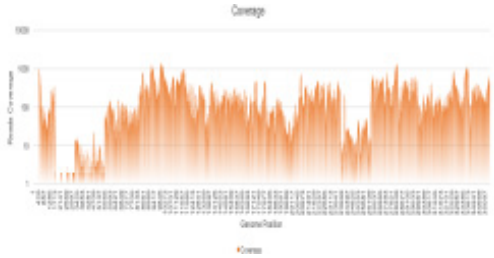


Fig.4 Sequence coverage after ONT sequencing

Other experiences

Apart from hands-on experience in the Laboratory at IVRED, I was happy and grateful; to participate in the scientific presentation by Dr Gonzalenz Gabriel on findings targets for Pan-beta Corona Vaccines using Bioinformatic tools, where he identified more than 20 epitopes/mulltiepitopes that can be best targets for Vaccines hence improving the efficacy of the Corona vaccines in humans and other animals. Moreover, I also participated in the scientific poster presented by a student on How Pre-vaccination immune metabolic interplay determines the protective antibody response to a dengue virus vaccine.

Lastly, since I have been particularly interested in Japanese culture, especially in the Japanese martial arts, It was a good opportunity to meet with Shihan and Sensei at IMAI dojo located at 3-chome, Kita 21-jo Nishi, Sapporo, Hokkaido.

Fig.5 Cultural experience at IMAI dojo, Sapporo Japan

Public Health Laboratory Rotation Experience: Insights into Virology Research and Techniques

School of Medicine M2
Chibwe Shumbwa

Introduction

Public health laboratories serve as critical hubs for understanding pathogens, developing diagnostic tools, and mitigating disease outbreaks. During a two-day rotation at a renowned public health laboratory at Hokkaido University, I gained hands-on exposure to advanced virological techniques and engaged with leading researchers. This report details my experiences, learnings, and reflections, structured to align with the laboratory's focus on viral genomics and arthropod-borne diseases. The rotation not only deepened my theoretical knowledge but also underscored the practical challenges and rewards of public health research.

Day 1: Reverse Genetic Sequencing in Viral Genomics

Overview of the Technique

Reverse genetic sequencing is a cornerstone of modern virology, enabling researchers to study viral genomes by reconstructing them from cloned cDNA. This method contrasts with traditional forward genetics, as it allows targeted manipulation of viral genes to assess their functional roles. During my first day, I worked alongside an assistant professor and a PhD student, who guided me through the process of synthesizing and analyzing viral RNA segments.

Hands-On Experience

The procedure began with the amplification of viral cDNA using polymerase chain reaction (PCR). I observed how specific primers were designed to target conserved regions of the viral genome, ensuring accurate replication. The team emphasized the importance of contamination control, demonstrated by their meticulous use of separate workstations for RNA extraction and PCR setup.

One highlight was using a sequencing platform to analyze the amplified DNA. The PhD student explained how next-generation sequencing (NGS) technologies enable rapid identification of mutations, which is critical for tracking viral evolution. For instance, this technique has been pivotal in monitoring SARS-CoV-2 variants during the COVID-19 pandemic..

Reflections

This session demystified the technical complexity of viral genomics. While I had studied these concepts theoretically, witnessing the precision required in handling RNA and interpreting sequencing data was invaluable. I also recognized the interdisciplinary nature of this work, merging molecular biology, bioinformatics, and epidemiology.

I could also not help but think about how reverse genetic sequencing can be used in the fight against Human immune deficiency Virus. Could it be used as part of a process to create a virus that destabilises one of the HIV enzymes or indeed the whole viral genome thereby inactivating even the viral genome that has already been incorporated into the human genome? It's a possibility that could be explored in the fight against this viral disease that has so ravaged my country, Zambia

Day 2: Tick-Borne Viruses and Public Health Impact

Lecture on Japanese Tick-Borne Encephalitis Virus (TBEV)

On the second day, I attended a lecture by the laboratory's professor, Hiroaki Kariwa-sensei, a pioneer in tick-borne virus research. He discovered the TBEV strain prevalent in Hokkaido, Japan, and shared insights into its epidemiology, transmission cycles, and clinical manifestations. TBEV, transmitted by ticks, causes severe neurological symptoms in humans, with a fatality rate of up to 30% in untreated cases.

Research Contributions and Eradication Efforts

The professor discussed his team's fieldwork in Hokkaido, where they mapped tick habitats and identified reservoir hosts like rodents. Their work informed Japan's vaccination campaigns, significantly reducing TBEV incidence since 2010. Additionally, he highlighted collaborative efforts with agricultural agencies to control tick populations through environmental management.

Reflections

This session underscored the real-world impact of laboratory research. The professor's humility despite his ground breaking discoveries left a lasting impression. I was particularly intrigued by the intersection of ecological surveillance and public health policy, a theme I hope to explore further.

Challenges and Problem-Solving During the Rotation

Time Management

The rotation's brevity limited my ability to observe longitudinal studies. To maximize learning, I prioritized tasks, focusing on core techniques like PCR and sequence alignment, while reviewing published papers during breaks.

Conclusion and Future Aspirations

This rotation solidified my passion for virology and public health. The hands-on experience with cutting-edge techniques and interactions with esteemed researchers have inspired me to pursue a PhD in this laboratory. I aim to specialize in arbovirus genomics, combining field surveillance with genomic tools to address emerging zoonotic threats.

Plant Breeding and Genetics

School of Agriculture D3

Natasha Mwansa

Hybridization and Greenhouse Crosses

On day one of my visit to the school ofAgricultural Sciences, I went to the greenhouses where I carried out crosses on indigenous Japanese rice varieties. This involved manually transferring pollen from one rice plant to another to produce hybrids with desirable characteristics from different parent plants such as improved yield and disease resistance allowing for the development of enhanced rice varieties. This hands-on activity provided me with practical experience in plant breeding techniques.

19th July, 2024 – Laboratory

During my visit to the rice breeding laboratory, I gained valuable insights into several advanced techniques used in modern plant breeding including how genome sequencing is used to decode the entire genetic makeup of rice plants. This technology helps identify specific genes associated with important traits such as drought

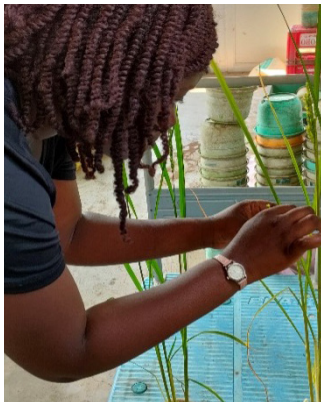


Fig.1 Crossing Japanese Rice

Fig.2 DNA Extraction from native rice varieties

tolerance or yield potential. I also participated in DNA extraction from rice samples to detect variations and confirm the presence of desired traits. I was oriented with the on-going Marker-Assisted Selection which involves the use of molecular markers linked to specific traits of interest to help identify and select plants with desirable genetic characteristics without waiting for them to fully grow, making the breeding process more efficient. I also learned about the importance of phenotyping which involves the evaluation of visible traits such as plant height, grain size and flowering time. Accurate phenotyping combined with genomic data allowed the team members to correlate specific traits with genetic markers.

Under One Health the sustainable development of rice varieties with enhanced resilience to climate change, pests and diseases supports both human and environmental health. By ensuring higher yields and reduced pesticide use through marker-assisted selection, rice breeding contributes to improved food security and promotes ecosystem stability. These efforts help create a more integrated approach where the health of people, animals and ecosystems are all interconnected.