

This report should be submitted within two weeks after you return to Japan. Please do not change the formatting

(Abroad · Domestic) Internship report form (Student) _____ (2024/03/06)

Name	MUNYEKU BAZITAMA Yannick
Laboratory	Global Epidemiology
Year (Grade)	D3
Internship institution	University of Zambia, School of Veterinary Medicine (UNZA-Vet)
Internship period	Internship period: 01/29/2024 - 09/02/2024 (two weeks) (Departure Date from Sapporo: 01/27/2024, Arrival Date in Sapporo: 02/12/2024)

- **Purpose and the reason why you chose this institute**

My internship aimed to acquire experience for my future work and establish a network for my career as a zoonosis control expert. My future work will involve monitoring pathogens in bats and studying bat ecology and behavior to predict spillover events and the likelihood of transmission to humans. I visited UNZA-Vet and joined Dr. Katendi Changula's field activities as part of my internship. UNZA-Vet has a long track record of research collaboration with Hokkaido University and is involved in a joint project on zoonotic viral diseases with my home institution. Moreover, UNZA-Vet is Zambia's leading biomedical research and infectious disease management organization, working closely with human health-oriented institutions (University Teaching Hospital, Zambia National Public Health Institute). Dr. Katendi Changula, my internship host, and her team have worked on filovirus surveillance in bats and bat ecology for the last ten years. She has acquired relevant skills and extensive experience monitoring pathogens in bats and other animals in a resource-limited setting. She has also been at the forefront of biomedical research and outbreak detection and response, working under the One Health approach as recently exemplified during the COVID-19 epidemic in Zambia. These reasons made UNZA-Vet a suitable place for me to experience One Health's collaborative work and learn how biomedical research can be sustained over the years despite local challenges (funding, supply chain, governance, etc.).

- **Result of the activity** (about 800 words, provide photos, tables and figures that clearly show the activities during the period)

a. Detailed schedule

Table 1. Detailed schedule of activities

Week 1	Monday	<ul style="list-style-type: none"> - Courtesy call to the dean of the School of Veterinary Medicine - School of Veterinary Medicine tour - Finalizing the internship schedule
	Tuesday	<ul style="list-style-type: none"> - Preparation of dissection kits - Laboratory operation and management
	Wednesday	<ul style="list-style-type: none"> - Preparation of sample tubes: smash tubes, tissue storage tubes (brain, salivary gland, liver, lung, kidney, spleen, bladder, colon). - Laboratory operation and management
	Thursday	<ul style="list-style-type: none"> - Label design and printing, medium preparation. - Laboratory operation and management
	Friday	<ul style="list-style-type: none"> - Laboratory operation and management: UNZA-Vet laboratories tour & daily laboratory operation and management.
Week 2	Monday	<ul style="list-style-type: none"> - Visiting ZNPHI - Laboratory operation and management
	Tuesday	<ul style="list-style-type: none"> - Laboratory operation and management - Packing for bat sampling - Repairing harp trap strings.
	Wednesday	<ul style="list-style-type: none"> - Visit the Suesueman (Leopards Hill) cave to set bat and rodent traps. - Collection of bat logger data inside the cave - Setting a harp trap at the cave entrance to capture fruit bats and collect swabs
	Thursday	<ul style="list-style-type: none"> - Collection of rodent traps from the cave - Visit the ZNPHI laboratory. - Laboratory operation and management
	Friday	<ul style="list-style-type: none"> - Final discussions - Wrap-up

b. Activity

Activities that I carried out during the internship can be grouped into three parts:

1. General laboratory operation and management

Laboratory operation and management can be challenging in resource-limited settings where suboptimal research funding, scarcity of reliable supply chain for

equipment, reagents, and consumables, and poor governance can undermine research outputs and the quality of service delivery. As I will likely be involved in operating and managing a research laboratory after graduation, learning how quality research can be achieved and sustained despite the abovementioned challenges was essential to me. During my internship, I had the opportunity to visit several UNZA-vet laboratories, experience their operation, and discuss with managers and scientists. Through these interactions, I got insights and innovative strategies that will be useful in my future work.

2. One-Health-based approach in infectious diseases management

Zambia has a unique environment where capacities in terms of skilled and trained human resources, biomedical research, and laboratory facilities are more developed in the animal than in the human sector. The animal sector, especially UNZA-Vet, is leading biomedical research and providing technical expertise to the human sector. To understand how these two sectors are closely working together under the One Health umbrella, I visited the Zambia National Public Health Institute (ZNPFI). ZNPFI is a specialized technical institution that leads Zambia's health security through surveillance and disease intelligence systems, emergency preparedness and response capabilities, specialized laboratory systems and networks, health information management systems, health security workforce development, and generation of scientific evidence through research. ZNPFI heavily relies on UNZA-Vet's established research and diagnostic capacities, especially for the surveillance, emergency preparedness, and response components. As such, both institutions have been informally collaborating since 2000 on virus surveillance (Marburg virus, Lujo virus, and Avian Influenza virus, etc.). This collaboration was formalized later through One Health research projects between UNZA-Vet, ZNPFI, Hokkaido University, and the University Teaching Hospital. An example of this collaboration is the recent development and implementation of a Marburg virus survey by UNZA-Vet and ZNPFI on humans living around Leopard Hill cave, where researchers from UNZA-Vet and Hokkaido previously detected and isolated the Marburg virus from Egyptian fruit bats. ZNPFI has also used UNZA-Vet technical expertise during the COVID-19 epidemic response in Zambia and the 2023–2024 cholera outbreak. Another example of how the One Health approach is implemented in Zambia is the development of the One Health strategic plan (2022–2026) involving the Ministry of Health, Ministry of Fisheries

and Livestock, Ministry of Green Economy and Environment, and Ministry of Local Government and Rural Development. One of the strategic plan's outputs is the One Health zoonotic disease prioritization conducted in July 2023, defining ten priority zoonotic diseases: African trypanosomiasis, anthrax, enteric diseases (salmonellosis), viral hemorrhagic fevers, rabies, plague, influenza-like illnesses (zoonotic avian influenza), zoonotic tuberculosis, cysticercosis, and brucellosis. Finally, ZNPHI relies on UNZA-Vet's expertise to design and establish its high containment laboratory (P3) and train human resources for the P3 laboratory. Next, I visited the Zambia National Public Health Reference Laboratory (ZNPHRL) to understand how surveillance and outbreak samples are collected, transported, and processed and collaboration with UNZA-vet for specialized testing. This unique Zambian experience will benefit my future career as a zoonosis control expert in DR. Congo, where, unlike Zambia, the human sector is far more advanced in biomedical research and outbreak response. I intend to use the Zambian experience to facilitate inter-sectoral collaboration and capacity building.

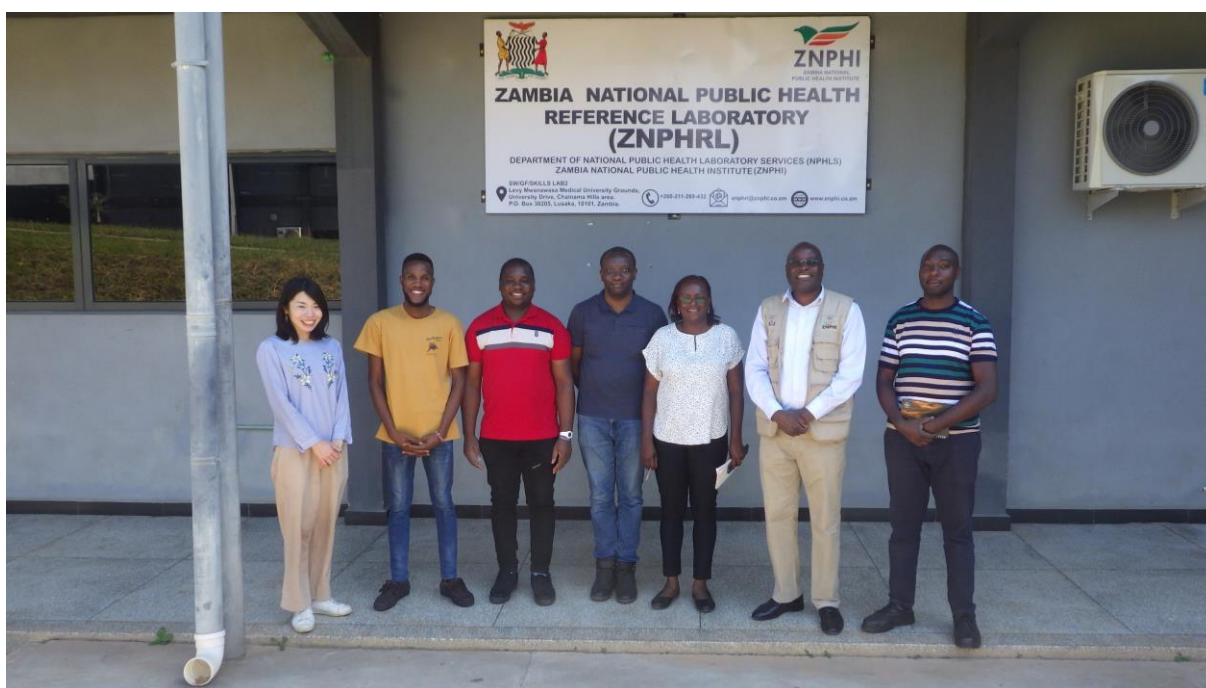


Figure 1. Visit of the Zambia National Public Health Reference Laboratory

3. Bat sampling.

I joined bat sampling at Leopards Hill Cave, where Dr. Katendi's team conducts Marburg virus surveillance quarterly. The day before sampling, I learned how to pack for bat sampling and repair Harp traps. There are generally two kinds of bat traps: harp traps and mist nets. Mist nets are lightweight, have a wide catch area,

and are easily set up. However, they can be easily damaged and could not be set at the chosen sampling site. Harp traps are more robust and heavier. They can be left unattended, unlike mist nets. On the sampling day, after correctly wearing full PPE, we entered the cave to set Sherman traps (for rodents) and collect data from bat loggers. As part of an ongoing collaborative research between UNZA-Vet, Hokkaido University, and Doshisha University, customized GPS loggers are attached to some bats to track their flying trajectories and understand their behavior. Logger data is collected twice a week inside the cave. We exited the cave after setting rodent traps and collecting GPS data.

Next, we set one harp trap at the cave entrance. Based on Dr. Katendi's experience, bats usually emerge from the cave after sunset around 7 pm. The first cohort of bats emerging from the cave are insectivorous bats (smaller in size). Then, around 7:30, female fruit bats will emerge, and male fruit bats will emerge 10 to 20 minutes later. Following this pattern, we removed the first bag (with insectivorous bats that were released), placed other two bags that collected fruit bats until the daily target of 25 was reached. There is an annual limit set by wildlife protection (Permit of capturing around 100 bats per year), and a wildlife ranger is always part of the field trip to ensure the limit is respected, animal welfare is ensured, and researchers are protected against possible threats. After removing bats from the harp trap bags using appropriate gloves, their sex was identified. Bats were then assigned an ID and weighed. Next, their forearms were measured, oral and rectal swabs were collected, and bats were finally released.



Figure 2. Setting harp trap (Panel A), full PPE wearing (Panels B & C)



Figure 3. Captured bats (Panel A), identifying bat sex (Panel B), weighed bats (Panel C), collecting oral and rectal swabs (Panel D)

- **What do you think the positive impact of the activity will have on your further career path?**

I intend to be involved in zoonosis control in my home country, dealing with laboratory work, fieldwork, and governance. Interactions with my host, some UNZA-Vet, and ZNPHI staff have shed more light on ways to efficiently contribute to shaping a practical One Health-based approach in the prevention, detection, and response to zoonoses of public health importance in my home country. Through this activity, I have established contact with some major players in Zambia's animal and human health sectors. I plan to deepen research collaboration to enhance regional zoonosis control capacities.

- **Report how your activity could link to One Health Approach (If applicable)**

If you also conducted OH onsite training, please describe some examples of the One Health approach you implemented in your activity. Otherwise, explain the possibility(ies) of how you could link this activity to the One Health approach for your future.

I had the privilege to interact with UNZA-Vet and ZNPFI staff and discuss their strategies to mitigate infectious disease threats jointly. As explained above, Zambia is a unique environment where human health (ZNPFI) relies on animal health (UNZA-Vet) for disease diagnosis, surveillance, and outbreak response. I have understood strategies put in place to efficiently address infectious and zoonoses, mutualizing capacities from various sectors. Beyond multidisciplinary, UNZA-Vet and ZNPFI collaboration is about complementarity and streamlining interventions to control infectious disease threats. I believe this internship was a nice experience to witness One Health.

- **Advice for your junior fellows**

Securing an internship can be challenging, and an internship spot can be lost anytime. Hosts are usually busy researchers, so keeping in touch with the host regularly and starting the planning process quite early is critical.

Beyond knowledge and skills, research is about networks that are not as open as they look online. In some cases, being introduced or recommended may increase the chances of being accepted for an internship.

Approval of supervisor	Institution • Official title • Name International Institute for Zoonosis Control, Division of Global Epidemiology, Professor Ayato TAKADA
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※1 A certification form from the host should also be submitted.

※2 The Career Path Committee will first confirm the content of this report and report will be forwarded to the Educational Affairs Committee for credits evaluation.