A Common Goal: The Union of Various Research Projects

International Livestock Research Institute/ Kapiti Research Farms

Nairobi/Machakos, Kenya

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ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

CGIAR

Personal Reflection

This research experience has been the most anticipated event of my summer and working through the challenge of determining what my paper would be about was the greatest obstacle encountered so far. During my journey to the International Livestock Research Institute (ILRI), I had many predictions on what kind of research project that I would participate in. With the prior knowledge that I would be in a different location after the first month, I understood that I would possibly be tasked with conducting research on numerous topics. Upon reaching my destination and making it to the farm I asked what kind of research would I be tasked with, this is where the challenges occurred. My supervisors were as confused as I was when it came to my focus during my time there, but this did not hinder them from ensuring I had the best experience they could offer. With their assistance, I was learning something new each day and finding myself in spaces unknown to me prior to my arrival. Even through all this, I was still worried because I did not have a concrete plan like I believed the interns were supposed to have. I persevered through this time of frustration and being stumped thanks to my supervisors, program director, and mother & father. With their help, I was able to come to the conclusion on how I would make my internship experience truly my own as well as how that would translate to this final paper.

During this time I have learned new skills that will be crucial to my development in pursuance of my career. Some skills like bleeding cattle or rectal palpation of cattle which I may not have obtained until later in my academic career. Every time I attained a new skill I also gained a little more understanding of the field I chose to work towards. After working with animals on a daily basis and asking questions about the work we were doing I was able to better understand the mission and goals of ILRI. Hands-on work is what I enjoy most and learning through hands-on experience has helped exponentially on my insight of the work I have been

doing. When it comes to the cultural differences of the Republic of Kenya the most prominent to me is the hustle culture of the people. Coming from Detroit, MI I have experienced the various ways people make money, but seeing the citizens of Nairobi selling everything from clothes, food, and various items to the bikers community offering rides and delivering food. A little insight I gained from these eye testimonies is more of what I learned as a kid at home; the money is there, you just have to want it bad enough.

Abstract

The center for three decades of livestock research and helping developing countries preserve their livelihoods in agriculture. Working to improve the structure of the agriculture systems that the majority of the citizens rely on will in turn enhance the careers of those who keep the country going. The ongoing studies into major diseases like East Coast Fever, which is currently undergoing boosting to make the vaccines more accessible to those that really need them and fight to reduce the cases and deaths of cattle. More serious cases like the African Swine Flu Virus with no known vaccine will be a significant discovery when one is eventually developed because of the mortality of the disease. Both studies are still in progress but it is with discernment that both will have positive outcomes in the livestock sector of agriculture.

Acknowledgments

Before I begin I would like to give my heartfelt gratitude to those that have helped me come this far in my journey overseas. From Ms. Rebecca and Ms. Renee to my supervisors Ms. Leah and Mr. Marvin here at ILRI. They have made my experience more than just knowledgeable but also one that holds substance and will for much longer than I expect it to. The veterinarians; Dr. Edwin and Dr. Dennis at the ILRI farm helped me attain the experience that would normally require me to wait to try it out, being an undergraduate student and studying animal science, having the chance to get that hands-on encounter with a variety of aspects of my future goals is something I will always hold dear to my heart.

The structure of this paper would not have been possible without the collaboration of Rebecca, Edwin, Leah, and Ilona. Providing me with the resources and knowledge needed to construct my paper, my way. It was a bit of a struggle at first when it came to deducing the specifics, but after utilizing the office hours I was able to gain some much-needed insight which has really helped me shape my internship experience into something worth sharing.

I would also like to extend my thanks to Mr. Terry Branstad, my parents; my father for accompanying me to orientation and ongoing guidance through this escapade and my mother for continued encouragement during this experience, as well as all of my family and friends for the cheers of encouragement from across the ocean.

Introduction

With numerous offices across the continent of Africa; Eastern, Southern, and Western, as well as South and East Asia and various projects scattered around the globe in partnership with CGIAR. The International Livestock Research Institute (ILRI) tasks itself with the mission of using livestock science and research to contribute to equitable, resilient, and sustainable agriculture systems that improve the lives of low- and middle-income countries. This goal is not only utilized to improve the livelihoods of people but also to benefit the climate and environment.

ILRI focuses on livestock because it is one of the fastest-growing sectors in agriculture, and the majority of the growth occurs in developing countries. They have been mandated to conduct different research on how to bring out more benefits and reduce the costs of livestock production for the citizens of those developing countries. The plan is to use livestock as a development tool, and it branches out into three sustainable pathways: securing assets, improving smallholder and pastoral productivity, and increasing market participation by the poor. They also employ a plan called the One Health strategy that is tasked with stopping the global rise of different diseases; zoonotic and foodborne as well as enforcing antimicrobial resistance. Currently, two major studies are being conducted that can be classified under the One Health strategy. ILRI not only deals with livestock and those who can benefit from its utilization but in addition to how it affects the greater world around it. One example is its overall contribution to Green House Gas (GHG) emissions and how that can be a factor in the livestock sector.

Participating in more than one research project provided me great example of the range of research that ILRI can operate at. They conducted research on cattle and it branched out in more ways than one could imagine. For example, they have successfully created a clone of a Kenyan

Boran cow with the assistance of genome editing tools. Through trial & error, the success of the cloned bull has opened the possibility of genetically modified cattle with handpicked traits. To combat the spread of East Coast fever, they also perform injection-treatment procedures on cow herds to monitor the progress and use the data to help produce an effective vaccine to distribute to farmers across the East Coast. These examples are only just the surface when it comes to the efforts of ILRI in improving lives through livestock. With various threats to the welfare of livestock and those that depend on the fruits of their labor that they provide. In the region of East Africa, livestock is the backbone for a lot of citizen's livelihoods as well as supporting its economy through growing demand for said livestock and its accompanying products.

To preserve this aspect of an entire region's livelihood as well as an important part of agriculture, ILRI performs numerous projects that work to extend the longevity and quality of life of the animals that so many depend on as a means to an end. Working on cattle gave the researchers an opportunity to study the effectiveness of a vaccine for East African fever. Collecting data from the group daily and observing the progress of the virus or lack thereof to incorporate into vaccine development. This kind of project was not exclusive to cattle, the swine on the farm were also the focus of vaccine development projects. As there is no known effective vaccine for African Swine Fever, a clinical study is currently one of the focuses. Working in a clinical facility allows researchers to monitor the health of the pigs, and with any collected data during the study use what is gained to develop a future vaccine.

As a developing country, Kenya still has a dependence on agriculture and its different components, in this case, livestock. The research that is performed by ILRI and its many partners

like the Kapiti Research Station in Machakos, has made it their mission to preserve and enhance the lives of those who rely on the utilization of livestock as a means of living. While conducting and performing their different research projects they are always working to improve the productivity of the animals through projects like the aforementioned vaccine development. The work that is being done is not only to serve the field of agriculture but is also thought of in the long term with sustainability plans around the world.

The efforts of those of ILRI Nairobi farm and Kapiti Research Station work to improve the lives of the citizens of Kenya as well as the East African region through various research projects.

Methods

Project 1. East Coast Fever Study

East Coast fever (ECF)is a tick-transmitted protozoan disease, *Theilaria parva,* of cattle that is usually identified by a high fever, dyspnea, lymphadenopathy, and high mortalities. It is only observed in the eastern, central, and southern parts of Africa.

The objective of this study is to develop an effective vaccine to combat the East Coast fever that is available in the regions it affects. The disease affects the cattle populations of the East Coast region of the continent. Through daily observation of the cattle and how they respond to the infection as well as the vaccine being developed data is collected from different points of entry on the cow. This collected data is then sent to one of the labs on campus to observe more attentively to any changes. The East Coast Fever is a significant livestock disease because it causes a great economic strain to livestock farmers as it kills at least one million cattle each year.

The study revolves around infection and treatment of, both the vaccine and disease, which are administered towards the beginning of the project with a technique referred to as the Infection and Treatment Method (ITM), which as the name suggests is the process of introducing the disease to the organisms immune system and shortly after the vaccine is administered. This method is highly effective, that normally provides a permanent immunity to infection related to *T. parva* parasites. The collection of the data necessary for studying the clinical signs of ECF in cattle is facilitated using various apparatus. The temperature of the cow is taken rectally by way of a thermometer before any of the daily procedures can take place. The blood and plasma must

be obtained through the jugular veins of each cow. This allows for a specific amount of blood to be collected each time. Next, the lymph nodes in each cow have samples taken using a needle to draw fluid and transported to a microscope slide to be sent to a laboratory to observe closely. The collected data is recorded on data statements and is updated with each passing day. After each cow is treated their holding pens are cleaned so that no new pathogens are introduced into the research environment.

Project 2. African Swine Flu Study

The African Swine Flu virus (ASFV) is a highly contagious disease that currently has no cure. It mainly affects the global pork production chain as the name suggests, and has killed about 2 million pigs globally since 2021. Its current range of infection is in Europe, Asia, and most recently parts of the Western Hemisphere.

A consortium of different organizations around the world have come together as well as ILRI and the main focus of this project is to develop a next-generation vaccine. The overall project is funded by the European Union and has been a major project at the ILRI Kenya farm for quite some time.

Since the mortality rate is often 100% in infected pigs, research on the time between infection and death is crucial. Before the group of pigs can be transported to the clinical facility, they must first be kept in an isolation facility to monitor them for any outliers that could interfere with the collected data. After a few weeks spent in isolation, the eligible pigs are transported into the clinical facility, and the ineligible pigs are moved to a separate swine facility. Even though

the disease is not zoonotic, biosecurity is still heavily enforced in the clinical research facility. First thing before any lab actions can be performed, the participants must shower and change into the appropriate Personal Protective Equipment (PPE). The next step in the procedure is to put on full body suits over the PPE. After taking the necessary precautions, the first part of data collection starts with the temperature taken rectally, spikes in the measurements are signs pointing towards AFSV, weight is measured after to check for weight loss as that is one of the chronic symptoms. Next, visual scoring is used to observe the behavior changes the pigs would experience. Over time the swine can be seen changing in their reactions to handlers, their joints, and increased heart rate.

After 3 weeks of the study, the swine are challenged, which is the process of preparing small concentrations of the virus and introducing it to the organisms' immune systems. It is called a challenge because they are given a prototype of the vaccine and after a certain amount of time to test the resistance to said virus. After this challenge day, the normal observation procedure is followed, but with consideration of the clinical signs that they will encounter.

If the pig is not able to fight off the virus and is inching towards death, the participants take the responsibility of carrying out humane endpoint practices. These are put into place when one or more predetermined physiological or behavioral signs are observed that distinguish when the animal must be euthanized to end the animal's pain. After a certain amount of time infected, this mark is reached and many pigs are euthanized. To study the effects of the virus further, post-mortem examinations are carried out to score the different organs and tissues that would be

changed by the disease. After examining the innards superficially, a small sample is then sent to the labs for a more extensive examination to understand the changes that took place in the body.

Project 3. Spray Race

This procedure is a way to disinfect the cattle that is found to be more effective than dipping cattle. Since the cattle are outside and roam the ranch on a daily basis they are exposed to the elements and of course, ticks that latch onto their hides. Dipping cattle is the process of adding chemicals into dipping fluids and submerging the cattle in the solution so that it binds with the skin and hair because of the on-contact kill of the procedure. The disadvantage of this method however is that it does not offer ongoing repellent like chemicals used in a spray race. Spray race is the process of a group of cows walking through a tunnel of spray nozzles to completely soak and clean the cattle of ticks, flies, and other external parasites that can find themselves on the cow. This innovation is preferred over dipping because it is a gentler alternative when used with dairy cows, not only that but it is more efficient than having to wait for the cow to be completely submerged and to the next.

Results & Discussion

The results of each study will surely be recorded well after the completion of this internship. So some predictions will be made about the ending of each individual study and how it came about. From what I experienced and discussed during the time that I participated, there are some things that I would like to see in the results and some reasons if they don't meet my expectations.

Starting with the ECF research, I understand that I was assisting in the collection of data for the improvement of an already-developed vaccine. Using the Infection Treatment Method, the participants are able to monitor how much the sickness may work its way through the body, depending on how effective the improved vaccine is the mortality of the testing cows should decrease. While collecting data one day, it was brought to my attention by one of the other participants that the death of a few cows was to be expected because of the study. The predictions stems from discussions had while preparing for the more severe signs of ECF in the cattle. While speaking with another participant, Dr. Edwin, and asking questions about the different protocols and how the data is used after each day, we got on to the topic of seeing a change in clinical signs in the cows and he himself predicted that a number of the cows may fall victim to the virus but some will endure. I predict that it will be some time after my departure from ILRI that the novel vaccine will be improved to significantly reduce mortality rates.

When it comes to the ASFV study, I can simply predict that it will be a long time before a viable vaccine is ready for distribution to the agriculture scene. From the humane endpoint I participated in, I could tell that a plethora of information and time is needed before one is ready. During the Humane endpoint period at one point, there were as many as 10 post-mortem examinations at one time. They were all a result of euthanization because of the effects of the virus. Seeing how the pig was before and how the virus affected the pig after running its course after the challenge day showed me that more research is needed before a vaccine can be distributed let alone presented as a finished product.

I have learned quite a lot during my tenure with ILRI. Each location gifted me with insight into distinct parts of livestock care, and I plan on utilizing this knowledge as I matriculate through the remaining years of my undergraduate years and use it to propel me forward when I move on to veterinary school. Gaining experience at ILRI HQ in Nairobi in its mostly clinical research setting afforded me more technical skills when it comes to data collection, observation; superficial and microscopic, and colony management with the different breeds of rabbit. At the Kapiti Research Station, I became more accustomed to animal welfare practices as opposed to more clinical practices. It was more routine to administer vaccines, do pregnancy palpations, herding, and restraining practices. These skills I have acquired are appreciated and will be honed at my school as Tuskegee University owns acres of land with livestock on it. Even though the studies I participated in were not concluded by the time my internship ended I hope to keep in contact and learn of the outcomes whether they are as I predicted or go in a different direction.

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