

Category Archives: *featured*

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BUFFALO TRYPANOSOMIASIS, A ONE HEALTH APPROACH

BY ZTD4 OCTOBER 18, 2017

EXPANDING HORIZONS PROGRAM, FEATURED



In Indonesia, we traveled to a remote village, Cegog, the most remote village in Java and the buffer village closest to the protected Ujung Kulon National Park. To give some perspective on what it means to be a “buffer village”, the Rhino Protection Unit took a video recording of a large, adult male Javan Rhino just 4 km from where we were staying.

This trip was not originally planned as part of our internship. However, alarming results from a serological analysis done on the water buffalo in Cegog months earlier prompted an emergency response from WWF. The serological analysis was done on the entire 101 water buffalo by WWF veterinarians, Drs. Kurnia, Gita and Zulfiqri. The results yielded a 91% seroprevalence of trypanosomiasis in the herd. This is contradictory to the normal endemic prevalence of around 10% to 20%. Thus, this was an outbreak that required immediate action.

In mid-June, during our first field sampling trial in Sumur buffer village, we received the news. Dr. Nia

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THE ELEPHANT DIARIES, PART 1: ELVINA YAU (2020)

BY WILDLIFE BLOG EDITOR SEPTEMBER 6, 2017

EXPANDING HORIZONS PROGRAM, FEATURED

Rising second year veterinary student Elvina Yau is in Chiang Mai, Thailand, conducting research on Asian elephants. Over the next few weeks, she will be contributing a series of posts called **The Elephant Diaries** about her unforgettable experience! Check out Elvina’s personal blog at [Elvina The Explorer](#).

My name is Elvina Yau and I am a rising 2nd year veterinary student at Cornell. While my professional interests include Companion Animal Medicine and practice ownership, I am also passionate about wildlife conservation. Expanding Horizons was an excellent opportunity to further explore this realm in an international setting.

I partnered with the Elephant Research and Education Center (EREC) at Chiang Mai University Veterinary School to conduct research on Asian elephant welfare. EREC was founded in 2010 with the objectives of conserving the Asian elephant species and preserving the elephant-based culture that Thailand embodies. According to the IUCN Red List, Asian elephants are listed as Endangered. Currently, Thailand’s remaining wild population is estimated at roughly 2,000-4,000. Without significant changes, the number of elephants may critically decline to levels beyond restorability. The country’s industrial shift from logging to tourism after the 1989 commercial forestry ban marked the rise of elephant camps. Many Asian elephants and their mahouts (caretakers designated to individual elephants) who were once employed in logging and resorted to illegal street performing now live in tourist camps as rescues. These camps enable the elephants to roam freely and interact with visitors while providing employment for the local community. The standards of care provide

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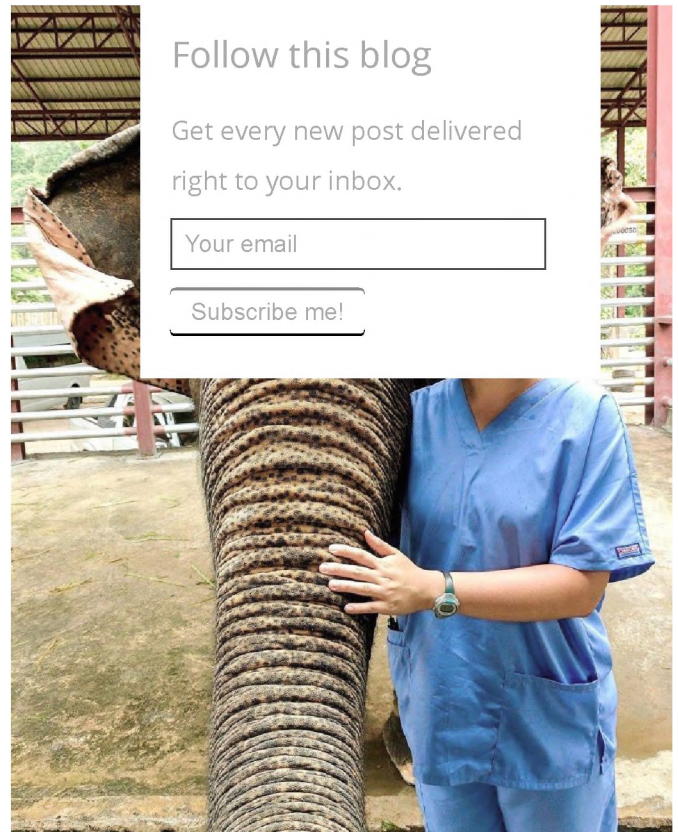
and Dr. Gita asked me to help with the outbreak by first drafting a one page Emergency Outbreak Response Protocol for Trypanosomiasis in Water Buffalo. This legislation was to be sent to WWF headquarters in the United Kingdom, to grant us funding to address this outbreak and future outbreaks. It also was translated in Bahasa Indonesia to be distributed to government officials for approval to work in Cegog. This was the first time I have been involved with writing legislation, especially in the context of conservation. I thoroughly enjoyed the process and learned immensely from it.

From the literature and having a basic understanding about the bureaucracy behind Javan Rhino conservation, I tailored the document towards the economic benefits of addressing trypanosome outbreaks. Money talks, when it comes to conservation. I structured the protocol into four components. First, the treatments proven to be most effective in mitigating parasite loads in water buffalo: Diminazene Aceturate (DA) at 7 mg/kg intramuscular injection to a seropositive animal maximizes efficacy (often curative) and decreases the risk of parasite resistance. Next, I addressed the importance in creating good relationships between veterinarians and farmers. Farmer education of the life cycle, clinical signs, health impact, and economic loss accrued from chronic trypanosomiasis in their herd builds trust and incentive for a long term veterinary care. Additionally, informed farmers allow earlier detection of outbreaks and rapid response. The third component was diagnostic testing. Antibody Detection ELISA on blood samples from every buffalo during a suspected outbreak is the recommended method, with simultaneous trapping of Tabanid flies – the vector of trypanosomiasis – and PCR on fly blood meals for presence of trypanosomes. The fourth component was on prevention. Prevention requires creating a more proactive and structured approach towards dealing with trypanosomiasis. Yearly testing and physical assessment, along with farmer education and subsequent treatment of herds twice a year with effective drugs, are the most cost- and time-effective ways to reduce prevalence of trypanosomiasis. My conclusion reiterated that it is paramount to address these emergencies early and effectively, to not only reduce the economic burden on farmers and the Javan economy, but also to protect one of the most endangered and praised species to Indonesia: the Javan Rhino.

Dr. Nia and Dr. Gita really liked the approach I took towards addressing the outbreak, and distributed the document to be reviewed. Several weeks later, we

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vary. The complexity of tourist camps arises from the fact that elephant rescues are given a place to live at these sites, but tourism generates the income needed to provide sustenance and veterinary care for these elephants.

My project specifically investigates how elephant foot health is affected by housing factors, which is a reflection of the management practices at various tourist camps. Conditions such as hard flooring substrates, high workloads, or excessive feeding have been associated with the development of foot abnormalities. By performing thorough physical examinations and working directly with mahouts, I've been able to inspect the limbs of multiple elephants and use a foot assessment checklist to score the severity of foot pathology on the toenails, interdigital spaces, and footpads. Our team then applied this data by providing facility and husbandry recommendations that will improve elephant welfare at these camps.

Foot pathology comprises one of the most prevalent health concerns afflicting Asian elephants. Since health is a useful indicator of animal welfare, the data gathered from this study can help inform targeted management modifications that can be implemented at these camps, reducing foot disease while enhancing the welfare of these elephants. Studying the relationships between housing conditions and elephant foot health and appl tasks that involve a collaborat

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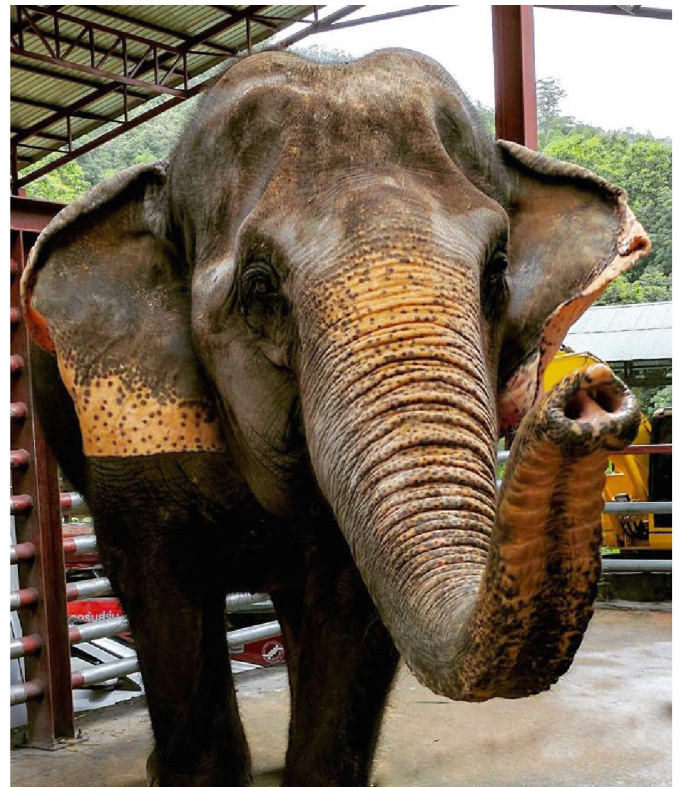
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received word that the request was approved. We were going to Cegog to address the current outbreak and put what I had written into practice. I was then asked to create an abbreviated physical exam checklist to specifically address trypanosomiasis.



I used the same method we are taught in veterinary school to address a disease process. First, I tailored my history-taking questions towards identifying factors that may indicate the presence of chronic trypanosomiasis. I asked farmers about the presence of abortion and about any decrease in market value in their herd, specifically regarding decreased weight and meat quality. Another important consideration is the function of the water buffalo outside the context of meat or extra revenue. These water buffalo are the organic machines that till their rice paddies and make work on the paddy much more efficient. This decreases the time it takes to farm and the number of personnel required to work on the farm, which allows other members of the family to work additional jobs or go to school. Chronic trypanosomiasis leads to chronic anemia, consequently causing cachexia (muscle wasting) and lethargy – decreasing the productive lifespan of the buffalo and the overall working interval for each buffalo. This directly correlates to a less productive farm, and mitigates the listed benefits of owning buffalo. Buffalo are sold earlier into slaughter, further decreasing the productive value of each buffalo and the number of birthing intervals possible. In order to assess the impact of trypanosomiasis on farm productivity, I tailored my questions towards these consequences. From just an economic standpoint, it is clear that this disease has a complex net of negative impacts that further perpetuate the socioeconomic problems these remote villages face.

veterinarians, mahouts, and community members. Pursuing this international service-learning experience demonstrates the organizational and teamwork skills critical in the interrelated nature of any research and conservation endeavor.



Through Expanding Horizons, I witnessed the daily operations of elephant camps and clinics while immersing myself in the sights and sounds of Thailand. The experience dovetailed a clinical and research component that enabled me to hone my skills both as a budding clinician and inquisitive scientist. Obtaining a first-hand view of Thailand through a unique veterinary lens ultimately allowed me to delve into a new facet of my career path while assisting EREC in their efforts to champion elephant welfare.

From this experience, I wanted to gain not only clinical knowledge, but also better understand the institutional factors and management strategies that wildlife conservation hinges upon. Veterinary care is essential to maintaining the health of the elephant herd, coupled with educating the global community about these issues in order to promote conservation efforts. At Chiang Mai, I was placed in an incredible position to help provide veterinary services to and conduct research on Asian elephants—a formative and intensive experience during which I learned about the complexities and joys of caring for numerous elephants, and what advocacy entails.

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My next step was to customize the physical assessment to specifically look for trypanosomiasis, by looking for key clinical signs and establishing a diagnostic protocol to rule out other disease. Thankfully, much of the diagnostic rule-outs have been established in this herd. The veterinary work done on this herd earlier in the spring ruled out many of the diseases that look like *Trypanosoma evansi*, such as hemorrhagic septicemia and anthrax (all diseases that were proposed to be a cause of mortality in the Javan Rhino). Using what I have learned from the physical exam of the cow in veterinary school, I created a checklist of clinical signs to look for the manifestations of chronic trypanosomiasis in water buffalo: TPR, clinical signs of surra (cachexia, lethargy, weakness, recumbency, CNS signs, conjunctivitis, edema, inappetence, dyspnea, diarrhea), and signs of anemia (pale mucous membranes, cold extremities from poor peripheral perfusion, lameness, tachycardia and bounding peripheral pulses).

With the checklist (also translated in Bahasa for Dr. Zulfiqri and Dr. Gita), we conducted physical exams on the entire water buffalo herd in three days. First, with mediation from Dr. Zulfiqri and Dr. Gita, we met with all of the farmers to educate them on the common disease of water buffalo, including trypanosomiasis, hemorrhagic septicemia and anthrax. We reiterated the negative impact these diseases have on their buffalo's health, and thus the economic benefit of establishing veterinary care for the buffalo. We also brought multivitamin tablets, oral de-wormers and an intramuscular ATP and B-vitamin supplement. To promote good veterinary-farmer relations, it is paramount that our interventions do not end at simply coming to the village, assessing the buffalo, and then leaving. WWF made sure to give the buffalo medicine that would help promote immune system function, RBC and muscle regeneration and de-wormers to combat trypanosomiasis and secondary infection. This would hopefully show the farmers observable improvement in their buffalo which would reflect the benefits of continuing to allow veterinarians to assess the health of their herds in the future. Also, if we find clinical evidence of trypanosomiasis, establishing respect between veterinarian and farmer is critical in allowing WWF to later return and treat directly for trypanosomiasis.

Next, with approval from the farmers, we spent the three days working two hours in the morning and two hours in the afternoon to work with the herd of buffalo (101 individuals). During the day, the buffalo were led into the forest (the national park) to pasture.

Participating in Expanding Ho therefore provided me with a unique opportunity to broaden my perspective of conservation medicine and truly explore the versatility of a DVM degree. As I progress on my veterinary career path and continue to cultivate my professional interests, I am excited to uncover what lies ahead.

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It is likely that buffalo walk the same paths the Javan Rhinos uses for browsing and foraging, which goes to show the urgency of a trypanosomiasis outbreak in this buffalo herd and the potential implications of disease transmission to the rhinos.



The PE success was variable on the buffalo. The buffalo are only tied by rope to a small piece of bamboo in the ground. There are no squeeze cages. The buffalo were also wild compared to their docile bovine cousins. Quite often, I would have to duck and dodge out of the way of their huge horns. I often had to rodeo with them to get temperatures or access a mucous membrane to look for pallor and CRT. Overall, I produced about 20 thorough physical exams out of the 101. The rest were observational, relying more on the history, looking for key historical information such as abortion, lethargy and decreased productivity and wholesale value. For some, this may have seemed like a nightmare. But, I loved every second of it – diving out of the way from buffalo, rodeoing them to get any meaningful information.

What did we find from the work we did in Cegog? Results were highly variable between farmers. Some herds were in better condition than others. All herds had very high ectoparasite loads, and consequently had very poor skin condition and hair coat. Most herds had emaciated individuals and evidence of muscle wasting. Most farmer histories included decreased overall whole sale market price, lethargy and decreased productivity. Most herds had evidence of anemia (pallid mucous membranes, poor peripheral perfusion, prolonged CRT). Most animals were mildly dehydrated (5%). There were several herds with abortion storms, as well.

There were some hurdles that limited our ability to maximize the efficiency of our work. The buffalo were difficult to work with, and don't like veterinarians –

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especially tall, white, hairy ones with Cornell scrubs. There was variable physical exam data, most being observational. Farmers were inherently wary of outsiders. We were the first foreigners this village had ever met. Dr. Zulfiqri and Dr. Gita were very helpful in mediating my questions on history. However, Dr. Zulfiqri and Dr. Gita seemed to think the farmers may have provided false information on history with regards to the presence of abortions and of illness and poor herd productivity. It is likely the conditions of these animals are far worse than I described.

So, what should we do next? Firstly, a more thorough PE survey must be done on every buffalo. I likely missed many individuals with fever and anemia due to lack of physical exam accessibility. Also, a more thorough diagnostic work-up, such as a CBC/chemistry and QATS, should be conducted on the most clinically sick buffalo. Finally, a more efficient system to developing the clinical history for individual buffalo, such as a number system for each farmer's buffalo, though ear tattoos.

After I completed the summarized physical exam assessment of what I found in Cegog, I presented my findings to the WWF Ujung Kulon team. I think the information I gathered will be a great foundation and resource for when they return to Cegog for future work. After my presentation, the team discussed what they thought (all in Bahasa). Dr. Nia translated, reiterating that they had liked the way I presented in the context of One Health, especially regarding the economic benefit of establishing a better veterinary-farmer relationship. She told me that the work I did on the original one page emergency response protocol had prompted WWF to organize a group to go once a year to villages like Cegog to establish the treatment, education, diagnostic and prevention protocols I helped create. They also planned to make the missions One Health-focused, by including environmental scientists and human physicians to address public and environmental health problems.

All in all, there is a lot I learned from this experience about the complexity and bureaucracy in addressing conservation issues in Indonesia. I learned a lot about conducting veterinary work in a developing country. I also became more knowledgeable about the vector biology and clinical manifestations of trypanosomiasis in water buffalo. Additionally, regarding veterinary work in a developing country, I concluded that developing good veterinarian-farmer relations is paramount. Establishing preexisting trust is the only way to successfully educate farmers on the human, environmental, and animal health benefits for

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instituting long term veterinary care for their buffalo. Veterinary care for these buffalo not only enhances the economic gain for these villages, but reduces the risk of zoonosis between human and buffalo and reduces trans-species transmission of disease to the Javan Rhino and Banteng.

By utilizing the tools of One Health, we can address a vast array of conservation issues – from tackling problems locally, such as this example, to addressing national, international and global conservation issues. It is very clear to me now how complex these issues are. Not one person, nor one profession can fix all the complex problems involved in conservation. Confronting human, animal and environmental health requires collaboration between institutions, disciplines, cultures, and countries. I am beyond fortunate to have had this realization at the start of my veterinary career. I cannot wait to see what is in store for our profession and myself in the field of One Health.

No comments

THE PRICE OF FREEDOM: HOW OUR CHOICE TO USE LEAD IS KILLING THE BALD EAGLE (PART 2)

BY WILDLIFE BLOG EDITOR AUGUST 3, 2017

FEATURED, IN THE NEWS

This post was originally published at [Science@CornellVet](#) on August 2, 2017 by Melissa Hanson, third year Cornell DVM student.



A juvenile bald eagle receives treatment at the Janet L. Swanson Wildlife Health Center

Last week offered a glimpse into the work the Animal Health Diagnostic Center and Wildlife Health Team has done to quantify the impact of lead on our native

No comments

THE PRICE OF FREEDOM: HOW OUR CHOICE TO USE LEAD IS KILLING THE BALD EAGLE (PART 1)

BY WILDLIFE BLOG EDITOR JULY 28, 2017

FEATURED, IN THE NEWS

This post was originally published at [Science@CornellVet](#) on July 27, 2017 by Melissa Hanson, third year Cornell DVM student.



Photo credit: Animal Health Diagnostic Center

The bald eagle is an American icon, a symbol of freedom, and for conservationists, one of the nation's greatest success stories. Restoration of the species has been a triumph. However, due to lead poisoning, the species has been

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wildlife, but what does the story look like from the perspective of Cornell's clinicians? Dr. Sara Childs-Sanford, a veterinarian at the Janet L. Swanson's Wildlife Health Center, a clinical service of the Cornell University Hospital for Animals (CUHA), shared her experience treating local wildlife directly impacted by the toxic element.

"A typical patient presenting with lead toxicity is a raptor species (bird of prey) or waterfowl. These animals are weak, and often have neurologic signs and ileus (failure of food to pass through the digestive tract)," says Childs-Sanford. "Concerned members of the public usually bring the animal to CUHA after observing it unable to fly or walk."

She explains that the primary treatment of these animals involves supportive care for dehydration and emaciation, and a blood draw to screen for serum lead values. Her team uses an in-house lead analyzer is to detect lead concentration in the blood, giving them a rapid answer regarding lead toxicity in a patient.

With the help of the analyzer, virtually every raptor or waterfowl species patient that comes through the door is screened for lead toxicity, allowing treatment to begin immediately. To target the lead, the Wildlife Health Center team uses chelation therapy, which involves the introduction of compounds that bind lead and thus allow it to be excreted by the patient. Chelation therapy is completed in five day increments for a minimum of two weeks, but many patients need to remain under the care of Childs-Sanford's team or a wildlife rehabilitator for much longer.

What harm can a little lead do? When ingested by an animal, lead is absorbed through the blood stream where it disrupts heme synthesis, a process required for oxygen delivery. The toxin is then distributed throughout the body where it deposits in soft tissue, organs, and bone, degenerating nerves and interrupting signaling pathways necessary for neurologic and gastrointestinal function. The prognosis for patients is widely variable and dependent upon the levels of lead detected, the organ systems affected, and most importantly, how long the toxicity has been present. In general, acutely affected animals carry a better prognosis than those with chronic exposure. Unfortunately, for waterfowl and piscivorous raptors, continually eating from a contaminated body of water often results in the latter.

or so we thought. As it turns c e placing unnecessary pressure on America's best known bird.

Cornell University's [Animal Health Diagnostic Center](#) (AHDC) employs some of the brightest minds in ecology and wildlife health. [Dr. Krysten Schuler](#), a wildlife disease ecologist, has been leading the research effort exploring the role environmental lead plays in bald eagle health. Schuler partnered with the New York State Dept. of Environmental Conservation to analyze two decades' worth of data collected from New York State to identify sources of mortality. Their results are disturbing: 17% of bald eagle carcasses examined revealed death due to lead poisoning, and 80% had measurable lead levels in their blood, tissues, or bone. Schuler reports that adult eagles are more likely to die from lead poisoning than juveniles, posing a serious threat to the reproductive success of the species because adults nest and rear young.

Where is all this lead coming from? A likely significant source is ammunition. Lead bullets are commonly and traditionally used for game hunting, which can leave trace levels in meat as well as in the environment. When carcasses or offal are left on the landscape, eagles will scavenge from them, consuming lead bullet fragments. Lead is toxic to all animals, including humans, and eating venison shot with lead bullets may pose a risk to consumers. Schuler explains that the bullet fragments when it hits its target, and small shards can travel more than a foot from the wound channel where they are less likely to be removed during the butchering process. Pregnant women and children are particularly sensitive to the toxic effects of lead, as developing tissues are vulnerable and easily damaged by the toxin.

So, how can we protect our families and our wildlife? Consider alternative ammunition. Modern non-lead bullets are inexpensive and do not foul firearms, as was once widely believed in the hunting community. These alternatives are safe and effective, and when combined with proper hunting etiquette, such as recovering carcasses and properly disposing of entrails, can make a real impact in the levels of lead present in the environment. Even recreational shooting with lead contaminates the environment, and participants should also consider alternatives. Lead bullets may be traditional, but they are also replaceable.

While 80% of bald eagles with measurable lead is a startling figure on its own, it is important to recognize that this species serves only a [Subscribe](#)



Radiograph of a common loon with a lead sinker visible in the digestive tract

So, what can you do to help? For Childs-Sanford, part of the solution is clear: don't use lead bullets or sinkers, and don't cut fishing lines into the water. "Lead in the wild comes from people," she stated, noting that its inexpensiveness and the lack of public awareness of its effects are likely to blame for its continued use. While the Wildlife Health Center is capable of treating animals on an individual basis, the true answer to the lead problem lies in addressing its source—us. Increased education for hunters and fishermen is vital, and eliminating the use of lead materials in our environment is the only way to save our wildlife from its devastating effects. Until then, Childs-Sanford and her team will take it one patient at a time.

Melissa Hanson is a third year veterinary student at Cornell University College of Veterinary Medicine.

entire picture. Lead is toxic to rans, and shared sources of food are the common denominator. "This is a problem that is both man-made and solvable," says Schuler, emphasizing that humans have introduced lead into the environment and therefore hold the responsibility of removing it as well. Research conducted by the AHDC brings to light the severity of lead toxicity in New York State, exposing it as a true threat to wildlife health where it otherwise may have persisted as a silent killer. Schuler adds, "Just because we don't see piles of dead eagles doesn't mean it's not a problem." Thanks to her contribution, both problem and solution are now quite clear.

Melissa Hanson is a third year veterinary student at Cornell University College of Veterinary Medicine.

No comments

EXPANDING HORIZONS BIO: ERIC TEPLITZ (2020)

BY ZTD4 JULY 18, 2017

EXPANDING HORIZONS PROGRAM, FEATURED

SARAH BALIK: THE BELIZE ZOO

BY WILDLIFE BLOG EDITOR APRIL 10, 2017

COURSES, FEATURED

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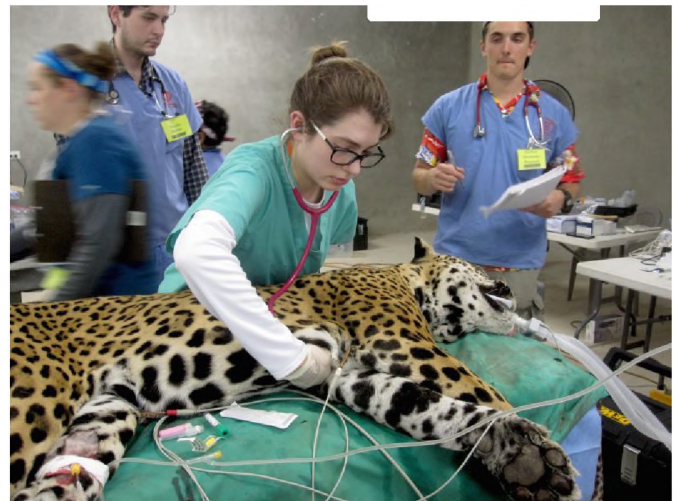
Eric Teplitz (2020) in Malawi through the Expanding Horizons program at CUCVM

My name is Eric Teplitz and I am a rising 2nd year veterinary student at Cornell. With an interest in infectious disease epidemiology, I participated in the Expanding Horizons Program with the goal of gaining applied research experience in the field. I established my research project with the Silent Heroes Foundation and the Lilongwe Wildlife Trust in Malawi, an organization that promotes wildlife rescue & research, advocacy, and conservation education. Illegal bushmeat and pet trading are prevalent practices in Malawi that are destructive to ecological health and biodiversity. The Lilongwe Wildlife Centre was established as a sanctuary for animals subjected to such crimes and aims to rehabilitate and release them into the wild.

I have been at the Lilongwe Wildlife Centre for the past seven weeks, and I have another two weeks before returning home. In my free time, I've had several opportunities to travel, visiting South Luangwa National Park in Zambia and Liwonde National Park in Malawi. I've also had the unique experience of scuba diving in Lake Malawi, which has a greater diversity of fish species than any other lake on Earth!

My research objective is to provide additional information for the Lilongwe Wildlife Trust's primate release program. Release strategies of captive wildlife are based on several factors that determine if, when, and how an animal will be reintroduced. One such factor is the risk of disease transmission from reintroduced animals to wildlife populations and humans, as failure to evaluate these risks can lead to unintended disease communication.

Salmonella and *Shigella* are groups of bacteria that colonize the intestine and cause diarrhea and inflammation of the gut lining. They are spread via



Sarah listens to a jaguar's heart at the Belize Zoo.

Hello! My name is Sarah and I'm currently a second year vet student. This winter break I spent a week in Belize. While Belize is a wonderful destination for visiting the beach, I wasn't there for vacation: I was there for a Cornell class called "Field Techniques in International Wildlife Medicine." Needless to say, as an aspiring wildlife veterinarian, this course was without a doubt the most fun, challenging and rewarding course that I've taken at Cornell so far!

The course is a collaboration between Cornell College of Veterinary Medicine and the Belize Zoo. The Belize Zoo was founded by Sharon Matola in 1982, and is so much more than a zoo. In my mind, the zoo is more like a sanctuary, rescuing and showcasing the native fauna and flora of Belize to educate locals and tourists alike. In fact, every species at the zoo is native to Belize. The exhibits for the animals are spacious and lush with native plants. It looks like these animals are living in protected plots of land in their native savannah, because they essentially are. Additionally, the zoo's wild animals are all rescued. Some of the animals are orphans; others were kept as pets for some time before being surrendered to the zoo. The zoo is also a home for "problem jaguars" – jaguars who, for whatever reason, developed a taste for domestic animals. Unfortunately, once a jaguar develops a taste for easy targets like sheep on a farm, much to the farmer's dismay, the jaguar does not go back to hunting its regular prey species like peccaries. So, as retaliation, some Belizean farmers may attempt to kill jaguars who are eating their source of income. In order to solve this problem, the zoo helps rescue these jaguars and gives them sanctuary.

The Belize Zoo's purpose is as much about education as it is about the welfare of th [Subscribe](#) of the

fecal-oral transmission – the bacteria are shed in the feces and subsequently ingested by another animal. These bacteria infect nonhuman primates and humans globally and are therefore critically important for both wildlife conservation and public health. Unfortunately, *Salmonella* and *Shigella* are difficult to treat medically, and consequently studying the patterns of shedding is important for informing disease management strategies through an understanding of transmission dynamics. At the Lilongwe Wildlife Centre, I am studying the shedding patterns of *Salmonella* and *Shigella* in primates.

The primary objective of my project is to identify temporal shedding patterns of *Salmonella* and *Shigella* as well as risk factors that affect shedding. Some examples include stress, age, sex, body condition, patient history, and concurrent parasitic infection. I designed a sampling schedule upon arrival, and currently I am collecting fecal samples for bacterial culture and diagnosing parasitic infections via fecal flotation. I have been evaluating stress through behavioral analysis, monitoring for behaviors that characteristically indicate stress in primates (such as pacing, self-grooming, and excessive scratching).

The project involves components of microbiology, primatology, and epidemiology, and the interdisciplinary expertise I gained during my first year of veterinary school has allowed me to conduct my research successfully. Designing and implementing an epidemiology study has been a useful learning experience as I find ways to adapt to logistical and technical constraints while in Malawi. Throughout the past several weeks, I have become more familiar with the procedures for primate integrations and reintroductions, which has guided my experimental design so that I can provide the most important information. In my remaining two weeks in Lilongwe, I will do my best to produce useful data!



A tapir says hello!

... e of Belize didn't know about the amazing wildlife in their own backyards until the zoo began educating them. It is also helping to dispel some myths engrained in the Belizean culture that will

ultimately help preserve endangered species populations, such as the fallacy that tapirs can skin a human alive with their snouts. I found this myth especially ironic because the tapirs at the zoo are so friendly! I got to hand feed a tapir a carrot and clearly left the encounter unscathed. This proves the value of education in promoting any conservation mission.

The course at the zoo is a win-win: our amazing faculty lead the effort to address any medical problems or routine examinations the animals may need, the keepers and staff at the zoo learn new animal management and medical techniques from the professors, the health of the animals is improved, and the veterinary students get the unparalleled learning experience of assisting with everything from routine vaccinations of the zoo's collection of animals to complex surgeries. In one week, I got to test a howler monkey for tuberculosis, diagnose external parasites on a kinkajou via skin scraping, and assist with a root canal on a jaguar, among many other incredible opportunities. This trip certainly reaffirmed my passion for clinical zoological medicine and desire to work to conserve the endangered species of animals in Belize and around the world.

The history of the Belize Zoo, as well as the conservation efforts that have been undertaken to preserve the biodiversity of Belize, are probably of great interest to any budding conservationist. If you're looking to learn more, I highly recommend that you read "The Last Flight of the Scarlet Macaw" by Bruce Barcott, a book about Sharon

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thank all of the Cornell faculty who had taught me so much over the course of merely a week, the lovely staff at the Belize Zoo and Tropical Education Center who hosted us so generously, and my fellow classmates who made the trip full of some of my favorite vet school memories.

ABOUT THE AUTHOR: Sarah Balik is a second-year DVM student at Cornell University College of Veterinary Medicine. She is also dual-enrolled in the Master of Public Health program through the University of Minnesota. Sarah is an aspiring wildlife veterinarian who hopes to help save endangered species by working at the interface of conservation and human public health.

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