Studying mosquitoes in Burkina Faso: A month in West Africa

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Purpose:

I am part of a lab that focuses on the reproductive biology of Anopheles mosquitoes, which transmit human malaria. With this award, I had the opportunity to go to Burkina Faso, a West African country, to study malaria-transmitting mosquitoes in their natural habitat.

First Impressions:

We landed at the airport in Ouagadoudou, the capital of Burkina Faso, around 7:30pm, and the night was already dark. The light of the city from the sky was much dimmer than any city I have flown over before, and the cityscape lacked almost any tall buildings. We exited the plane through a staircase onto the tarmac and rode a shuttlebus the 100 meters or so to the airport building, where our visas were checked before being allowed through the gates. We were picked up at the airport by a driver from the institute, and taken to a hotel where we would spend the night before driving the 5 hours to Bobodioulasso, our home base for the next month.

During that drive we had our first opportunity to really experience the scenery in Burkina Faso, both within the city, and on the countryside. I was fascinated by the view from my backseat, watching crowds of people on “motos”, or moped scooters, take us over on the street. There are by far more motos than cars, and all variety of people and objects are transported on these vehicles. Men and women rode on these vehicles, often with children as small as babies that were secured to the mother’s back with a piece of fabric tied around her waist. Oftentimes there would be one person driving the moto, with another sitting behind them precariously carrying a large bin of merchandise to sell at the market. The streets were lined with stalls of such merchandise, from fruits and vegetables, to rows of shoes, piles of ceramic dishes, and bottles of crude petrol used to fuel cars. Small stands of these petrol bottles would dot the route from Ouaga to Bobo, a solution for anyone in a pinch between petrol stations.

Aside from motos, another thing that stood out was the livestock that roamed freely on the streets, both in and outside of the city. Goats, sheep, chickens, donkeys, and even cattle (technically Cebu, a variety of bovine with a hump on their backs), could be found grazing on the side of the road, or in the meridian. Donkeys could also be seen pulling carts of goods, or sometimes these carts would be pulled by pedestrians themselves. The narrow dirt roads of the city are shared by pedestrians, carts, motos, and automobiles alike, necessitating a state of vigilance when walking along the road.

Striking as well was the green-ness of the country, in stark contrast with the red, red dirt of Bobo and Ouaga themselves. I must confess that I anticipated a much more dry and brown view of the country, and was surprised to find such lush vegetation. We did visit at the tail-end of the rainy season, when perhaps one would expect to find the peak of this vegetation, however the locals told us that the rice and maize are grown all year, and when one harvest comes, the next begins, suggesting that the green-ness is not exclusive to this time of year.

Along the drive we also passed through several towns and villages. The villages often consist of only 30 or so clay and brick huts, with a central mosque. At every checkstop or pitstop, the car would be

surrounded with villagers, often young children, holding up bananas, biscuits or tissues that they would hope to sell to you. On the way to Bobo, I found this somewhat overwhelming and intimidating, however by the time we repeated this drive at the end of the month I found myself talking and haggling with these salespeople much more comfortably.

During the trip I never tired of watching the scenery from a car window or walking down the street, as there was always something new to surprise me, and so many vivid colors and patterns, mostly on fabrics worn by the locals, who are generally very well dressed. Burkinabe clothing is often reflective of an individual's religion, from colorful fabrics printed with Catholic motifs like the Virgin Mary, to burkas or hijabs worn by Muslim women. Burkina Faso is a secular country, and it is inspiring to see such overt displays of religion received in such a tolerant way. In Burkina Faso, practicing Muslims work alongside devout Catholics in harmony and friendship, and no one seems bothered. Burkina Faso has a certain beauty and spirit that I felt were evident in every street-view.

Everyday Life and The Institute:

After arriving in Bobo we got settled in at our hostel, and went to meet our collaborators at the Institute. Burkina Faso is a French-speaking country, and although many of our collaborators did speak English fluently, or at least rudimentarily, I was very grateful to have at least a basic level of French. Being unable to communicate at certain times did confer a feeling of helplessness on those occasions, leading to insecurity on my part, as a woman in science, in Africa, unable to explain myself properly. That said I never did feel disrespected as a woman by my collaborators, who were very helpful and professional. There were more women working at the institute than I had been led to expect by colleagues who had visited in previous years, and although all of those whom I met were at training-level positions, I felt it indicated progress towards more women integrating into the scientific community in Africa.

Most of our time was spent here at the Institute, where we were working long hours in the laboratory. We had two different sites of work there, one where most of our reagents and bags stayed, situated next to an insectary where are mosquitoes were reared. The other was about a ten-minute walk away, where there was a microscope room, an insectary where our malaria infections took place, and a molecular biology lab. We used the molecular biology lab only rarely, as most of our work involved collecting and dissecting samples which would be further processed in Boston, but the lab was quite well equipped, with at least 4 PCR machines, a set up for running gels, and several types of centrifuges. The microscope room, too, was well set up, and although the room was heavily used and therefore generally full of people, we were almost never limited by the number of microscopes available. The lab spaces were air-conditioned, although the A/C unit in the first center where our bags were located was broken, making the space over 30 degrees and extra humid, such that it was akin to working in a sauna. In general, we were able to take our work elsewhere.

In general, the heat was something we got used to, and though a 15 -20 minute walk to the market at midday would leave us perspiring, when we entered and left the lab at the start and end of the day, the weather was generally quite pleasant. It was also less rainy than it usually is at this time of year, which caused us to worry about whether we would be able to collect all of the mosquitoes we need, as mosquito breeding areas dwindle when the rains are scarce. However, this proved not to be a problem, and after the first week's unusual lack of rain, we did end up getting a few downpours, some of which

were quite entertaining. One such incident occurred during our breakfast hour at the hostel, and caused us to have coffee, (well, Nescafe) by flashlight at 8am!

One significant limitation of the facilities was the WiFi network, which during our first couple of weeks was rather unstable, and throughout our entire stay was slow enough to make loading webpages on our laptops almost impossible. We did not have WiFi at our hostel, though we did know a restaurant that had a good connection, where we could go if needed. I found it interesting to be in a place where internet was more of a luxury, and where voice calling is anything but dead. Occasionally we would be in a vehicle with two or three members of the vehicle, all of whom were on their cell-phones talking in rapid French all at once (a little disorienting but entertaining).

The lack of stable internet didn't bother me, for our month-long stay, but I recognise this as something that is likely to limit their research capacities, as loading a paper on my laptop was a long process that was as often as not, unsuccessful in the end. It seems to be a widely recognised issue, and one that they will be striving to make progress in over the next several years.

The lack of internet at home at least made life rather simple, in fact. I felt it gave me more space to relax and breathe at the end of the day, without worrying about messages and emails coming in (from either the institute or somewhat worried family members). It also gave us limited entertainment options, which I believe fostered a group bonding environment, and allowed me to read more than I do at home.

We ate breakfast at the hostel almost every day, which consisted of omelette, a half a baguette each, and Nescafe. After a few days, I gave up on the omelette and was instead given an avocado (in Africa these are very large, and sweet!), and some cucumber. We ate our lunch at the lab, and because we lacked refrigerator space for anything that was not a lab reagent, we kept a variety of spreads (jam, peanut butter, hazelnut spread) that we would eat on our bread every day. To make up for this lack of variety at lunch every day, we did eat out almost every night, largely out of necessity as we did not have a kitchen at our disposal.

We ate almost exclusively at three well-reviewed restaurants, to decrease the likelihood of food poisoning. We occasionally explored other restaurants, however it is common in Burkina Faso that if you order something, the restaurant will have to go out to find what you ordered, and can take 2 to 3 hours to deliver your meal. As we often didn't leave the lab until close to 9pm, this was not a very appealing option, so we stuck to our three restaurants. In addition, due to recent terrorist attacks in Ouagadougou which targeted Westerners, we tried to limit our exposure in both Bobodioulasso and in Ouagadougou, by having a taxi driver take us around the city instead of walking, particularly at night, and by not going to many unfamiliar places, which was more reason to eat at restaurants we knew.

Eating out was inexpensive compared to Boston (it cost about $30 for the four of us to have a good meal and a beer). Buying food at the street market was even more inexpensive, however several imported products cost more money in Burkina Faso than they do here in the USA. Our hotel rooms were also not too inexpensive, costing about $700 US for each of us. However, we had Western style accommodations, including air conditioning units, and each of us had our own bathroom. This privacy and comfort was more important for a stay in which we were working long hours than I felt it would be for a vacation, but getting as much sleep as we could and a little space to relax was helpful.

This daily routine was supplemented by a few medications, including malarone of course, a multivitamin, and a daily prophylactic Peptobismol. As time went on I would often forgo the Pepto with limited consequences, but I do believe it helped. For the most part we stayed healthy, with only one of our group falling victim to a fever, probably of viral origin. Unfortunately, she was prescribed some antibiotics just in case, and turned out to have an allergy to the medication, prolonging her illness and fatigue. But she was back to work within a week, and as the only significant health-related incident for four people, we did fairly well.

The Swarms:

From our base at the institute, we would occasionally go on excursions to the villages for two reasons. The first was to go collect mosquitoes from mating swarms. Mosquitoes mate in swarms of thousands of mosquitoes, in which the males will initiate and form these swarms at exactly the same place every night. Females will enter the swarm to mate, which they must do only once in their lifetime to fertilize several batches of eggs with sperm they store from this single mating event. These swarms are being studied by the Institute, and they have well-documented maps of the swarms in several villages on the outskirts of Bobodioulasso. In these villages they have had a program for over a decade to train villagers to capture mating couples from the swarms. For our experiments, we needed natural mating couples, as well as swarming males, from these swarms, so I was lucky enough to visit two such villages.

The villages, called VK5 and VK7, are in an area called Bama, where the main industry is rice cultivation. VK7 is a rather large village in the midst of these fields, where herds of Cebu and other livestock roam free on a heavily rutted road through the village consisting of clay and brick huts. At the edge of the village, the Institute has also established a research facility where artificial swarms can be studied in a near-natural environment, and research huts which are used to study and evaluate the effectiveness of insecticide sprays on the inside of the hut. VK5 is a smaller village, situated in a cluster of trees in the center of the rice fields. It is a beautiful place, and we were told by one of our collaborators that the inhabitants have remained in this location for hundreds of years because they believe that their ancestors live in the trees there.

When we arrived at a village to catch mosquitoes from the swarm, we would arrive at about 6pm, and meet with the villagers who have been trained to catch couples. Mosquito-catching nets would be distributed among them, while cups to house the couples would be set up in crates on the ground. The swarms often took place in someone's yard, so we would meet the owner of the property and exchange handshakes, and then enter their yard, often occupied by livestock, and children and other villagers who would come by to observe the goings-on.

The swarms began around 6:20pm, when the first male enters the site. Within seconds, other males gather and begin swarming, and these swarms build to thousands in only a couple of minutes. At this point, dusk would begin to fall, and seeing the swarms was more difficult than one might assume, given that it consists of thousands of insects. However, especially as the night began to darken, I found it hard to observe the mating couples, let alone to catch them. I was very impressed by the skill with which the villagers would spot, catch and then aspirate from a net, a single couple from the swarm. The number of couples that we would catch would be highly dependent upon conditions like weather, and whether the swarm was disturbed at any point during the usual 20-30 minutes that they lasted. If disturbed, sometimes the swarm would rise out of the reach of the catchers, or disperse completely, but a good swarm could yield 30 or more captured couples in a night.

The “Sorties”:

The other purpose for our excursions was to screen children from villages for malaria infection. The purpose for this was not solely to diagnose and treat malaria, but for our experimental purposes as well. To perform infections of mosquitoes in Burkina Faso, we used malaria-infected blood taken from patients to feed to mosquitoes through a membrane.

How it works is that we go to a village, where the Institute has worked to establish a relationship through a trusted member of the village called a liaison. The liaison will alert members of the village when the Institute is planning to come for a “sortie”, and families will bring or send their children to a location within the village where the malaria screening will take place. Here, the institute will have tables and a system set up to have the children form a line, and be assigned a number, for confidentiality. The children will then be given a finger prick, and have a smear done with their blood, on a microscope slide. The slides will be analysed in the lab for the presence of parasites, as well as the red cell count, which can indicate malaria infections through anemia.

After the children have their blood taken they are given biscuits. Children that are too young can be given antimalarials without being part of the “sortie” program, as they cannot ethically participate.

When the diagnoses are completed after returning to the lab, children with the highest parasite load will be asked to come to the lab the next day, where their blood will be taken and used for our experiments. They are driven by a member of the Institute, and their parents, as well as the liaison, can accompany them to the Institute, where they are given a big breakfast before the laboratory activities begin.

These children, as well as any others who are positive for malaria after the screen, are given drug treatments. Oftentimes, the children that are positive do not display symptoms, but the drug therapy is still beneficial for the entire village by decreasing transmission of malaria. Generally, about a hundred children are screened at the sorties. It is not uncommon for half of the children tested to be positive for malaria, and in the high-transmission season, malaria infection rates can be up to 80%.

The “sortie” was one of my favorite experiences from Burkina Faso, because of the positive attitudes of both the children and researchers, and the feeling of cooperation and rewards that come from such a program. I was very impressed, and hope to see this type of program continue and spread to other institutes and villages.

Reflection:

I believe this trip to Burkina Faso will stay with me for a long time, both in my scientific career and personal life. I loved being in this type of working environment, where time is limited so you do all you can with what you have. I also believe this trip altered my perceptions of what life in Africa is like. Many of these perceptions I probably never really knew I had. Africa has poverty, but desperation and poverty do not characterize the people who live there. The Burkinabe individuals that I had the good fortune to meet are self-possessed, proud, and lively individuals. People are of a low-stress disposition, and are very accommodating and friendly hosts. There is a lot of joy and warmth in Burkina Faso, and I believe America could take inspiration from this.