SUMMER FOOD SYSTEMS FELLOWSHIP PROGRAM 2012

MICHIGAN STATE UNIVERSITY
College of Veterinary Medicine
To help meet the need of providing experiences for veterinary students focused on serving the food animal industry, the Michigan State University College of Veterinary Medicine established the *Summer Food Systems Fellowship Program* in 2006. The goal of this program is to provide a training experience that broadens the student’s vision of and experiences in the food industry. This is facilitated by partnering with the animal agriculture industry in providing a unique and valuable summer experience that adds value to the students education.

2012 marked the 7th year for the *Summer Food Systems Fellowship Program*. Eighty-seven food animal interested students and twenty-three different partners have participated in the program since 2006. Partnerships have been forged locally, nationally (Kansas, Iowa, Washington DC) and internationally (Chennai, India). The willingness to participate in a new and innovative program underscores our partner’s commitment to the future of food animal agriculture and the need to train well qualified veterinarians to work in the food industry. Most importantly, their mentorship of students has provided invaluable experiences that have broadened the skills of food animal interested students. We believe these skills will make these future professionals better prepared to meet the needs of the food animal agriculture industry not only in Michigan but nationally and internationally. Our partners deserve most of the credit for making this program the successful.

In this publication, you will find brief descriptions of the experiences of the student participants in the 2012 *Summer Food Systems Fellowship Program*, as well as highlights from the program this year. You can also find more information about the program at [http://cvm.msu.edu/fsf](http://cvm.msu.edu/fsf) or visit our FSF blog at [http://msufsf.wordpress.com/](http://msufsf.wordpress.com/) or join us on Facebook at [http://www.facebook.com/groups/1223313877777239/](http://www.facebook.com/groups/1223313877777239/)
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The Pfizer Animal Health division is made up of 9,000 employees spanning 70 countries. Products, including companion animal and livestock pharmaceuticals, are marketed to 120 countries worldwide. This summer I was fortunate enough to work with this cutting-edge company at one of their research farms in Richland, MI. The Richland farm consists of 1200 acres of farmland with 30+ buildings housing dogs, cats, chickens, beef cattle, dairy cattle, pigs and goats. The farm has a fascinating history having seen many owners from the Upjohn Company, to Pharmacia, Pfizer and now Zoetis. The Pfizer employees have acquired a wealth of knowledge in the animal pharmaceutical industry; they have adapted as the company has changed names and as regulations on animal research has transformed. I enjoyed talking with the many different people that work for Pfizer and getting their perspectives about working in this ever-changing industry. It is truly amazing how many different people, with different experiences are employed by Pfizer and how the company utilizes all their skill sets.

On the farm, I worked predominately with the non-containment cattle group, who are responsible for many of the animals at the facility. From the name, it may sound as though I only worked with cattle, but this group also maintains goats and sheep for research projects. I was assigned to work on a discovery project involving their goat herd. The herd required a fair amount of data collection on both a daily and weekly basis. I became proficient doing venipunctures, milking and also interpreting ultrasound results from these animals. In addition I was presented with opportunities to assist other groups with their studies. This included analyzing duration of immunity, modifying label claims and conducting safety studies. Assisting with these projects gave me many opportunities to work with other livestock species and also gave me a glimpse at the multitude of studies that are conducted for the various products Pfizer manufactures.

Throughout my internship, I participated in several necropsies for a variety of species. Many of the facilities both containment and non-containment require specific tissues to be taken from the animals on study. This experience was priceless to my internship as I was able to gain a lot of hands on experience working with researchers, pathologists and other Pfizer employees. During these necropsies it was also important to report any abnormal findings, therefore I became proficient in determining abnormal presentations and reporting them as they were observed.

I was also present and helped prepare for the USDA annual inspection on the farm. Pfizer is inspected by both USDA and AAALAC (voluntary) inspectors, which they are both accredited
by. It required a great deal of work to get the farm ready for inspection and it was interesting just how much detail the inspectors were looking for when they came to evaluate the farm.

All and all my summer at Pfizer was a very good experience. I developed a greater appreciation for the work that goes into the manufacturing of animal pharmaceuticals and now have a better understanding of just how many animals and workers it takes to ensure the safety of these products. I was also introduced to some unique professions in the field of veterinary medicine that I may have not realized prior to my internship. As a future veterinarian, I learned a great deal about how studies are designed and carried out in order to obtain meaningful results. I think that observing these processes will help me in evaluating drug trials for new pharmaceuticals coming onto the market, and thus better prescribe to my future patients.
This summer I was fortunate enough to work at Neogen as an intern. I have really enjoyed my time here and have learned a lot. In the first week, I spent time reading literature on the things I was going to be researching and brushing up on my microbiology lab skills. Although I had a microbiology lab course in my undergraduate studies, I had never been in an equivalent industry lab. I worked specifically in the pathogen detection group in Neogen’s Center for Microbiological Excellence in Lansing, MI under the supervision of Dr. Preetha Biswas and Dr. Jennifer Rice.

Initially, they thought I would be working on a mastitis project, but I was soon given a project detecting antibiotic residues in cow urine. Neogen already makes a test called BetaStar Plus that is a dipstick, or lateral flow device, that detects 6 drugs in milk (amoxicillin, ampicillin, cephapirin, ceftiofur, cloxacillin, and penicillin). The dipstick is placed in a vial containing a fluid sample. The fluid runs up the dipstick bringing with it receptor molecules that can bind to test or control lines. The test takes 5 minutes to run and displays three lines per dipstick: one for beta-lactam antibiotics, one for ceftiofur, and a control line. Presence of a line indicates a negative result, and absence of a line indicates a positive result. Although I was in constant communication with my supervisors, I was the only person working on getting BetaStar Plus to work in urine. It seemed like it could be a daunting task, but within a couple weeks I had...
discovered a buffer that would allow the urine to run similarly to milk without false positives.

Several times each week I would go out to the MSU Dairy Farm or Green Meadows during the morning collecting urine samples. I would definitely say my expertise in stimulating cows to urinate has exponentially increased over the course of this summer. I also became more familiar with the way dairy farms keep treatment records. In the afternoon I would run tests on the urine in our laboratory at Neogen. I learned a lot about lateral flow devices and the mechanism of how immunoassays work. Troubleshooting in the beginning was frustrating at times, but the project moved along swiftly.

We originally thought it might be a good idea to test the urine to indicate whether the cow’s milk would be safe to go back into the bulk tank or not. However, it quickly became apparent that there is a lot more antibiotic present in urine than milk, oftentimes tens to hundreds times more. A cow’s urine could test positive for beta-lactams up to 5 weeks after the last dose! When we realized that, we decided the test may be better used as a pre-slaughter test to indicate kidney levels. If a farmer had not followed label directions when treating a cow or wants to be more certain their cows have reached safe levels of antibiotics before sending to slaughter, they could test the cow’s urine to see if her kidneys were at a level below the maximum residue limit.

Working at Neogen was a very enjoyable and rewarding experience. I did not just show up to work and do menial tasks; I used problem-solving skills and critical thinking every day. My supervisors and co-workers in the lab were easy to work with and great to be around. Even though I was working on the project by myself, I always felt like I had a support system to go to when needed. The knowledge I am taking away with me will be invaluable as I go on to practice large animal medicine in the future. I have learned how many tests and assays work, and I can better appreciate all of the time and steps that go into developing them. It may even be possible that I could be using products that I helped to develop this summer at Neogen. I am so grateful to have had the experience.
From the time I started vet school I had always picked up on a certain set of feelings associated with any discussion of a pharmaceutical company. Depending on who joined the conversation those companies were considered anything from partners in the animal health field to dubious, profit-driven corporations. After completing an internship in cattle medicine the previous summer I knew I was going to have to deal with pharmaceutical companies a lot in my chosen path, so this summer I applied and was accepted to the MAH Food Systems Fellowship position to find out exactly what these companies were all about. During the summer I met many people that work for or are associated with MAH; all of them were knowledgeable, had great integrity, and were truly interested in helping me along my path towards becoming a veterinarian. The things I saw this summer give me great confidence in their commitment the animal health field.

Dr. Mike Bolton was my supervisor for the summer, and though I saw him for only 3 days of it he was a great guide through the experience. He let me know at the outset, and I want to reiterate it here for anyone reading this in consideration of applying for the position next year, in order to be successful in this position you will need a little bit of intelligence, the flexibility of a rubber band, and a well-developed sense of adventure. Things move and change very fast in this industry so plans are often made late and rarely stay the same throughout a summer. This challenge was extremely beneficial for someone who plans to enter a private rural practice where things will change just as fast. The sense of adventure comes into play because I was lucky enough to travel to many places this summer to get first-hand experience of numerous projects currently going on in at MAH.

My first foray was to Lubbock, TX to attend an intensive producer meeting for a MAH product. It consisted of about 3 days of lecture and hands-on activities, all having the goal of providing the producers with as much information on the product as possible. While on this trip I was able to learn a lot about the product, learn about beef cattle grading and marketing, visit a feedyard where the product was in use, and talk to people with diverse roles in MAH. I was also able to enjoy a little steak but strictly as a part of scientific research into beef consumer preferences. What struck me most about the trip, besides all the new knowledge I gained, was how much MAH invested in education for producers who were already using their product.
The next project was to help a dairy vet in SW Kansas film some material for presentations on low-stress cattle handling. This independent veterinarian is contracted by MAH to talk about that topic at various producer or industry meetings. This a part of MAH’s larger initiative to promote low-stress animal handling which also includes the production of online educational modules in association with the University of Minnesota. While working on dairies in the area, I was able to learn about specific handling techniques, topics in dairy veterinary consultation, and was also able to practice my palpation and ultrasound skills. Unknowingly, I learned when I got there late Monday night that I would be giving a presentation on Friday, and I would be giving it through a Spanish interpreter. The topic was manipulation of reproductive hormones in dairy cattle, and the experience was a first for me and definitely a confidence booster.

After 2 trips most of the way across the country I was excited to hear my next assignment was going to be closer to home. I was able to ride with a sales representative from Indiana for almost a week and learned a lot about the company and how they do business. The first part of the trip was calling on a couple veterinary practices to educate them about MAH’s new macrolide antibiotic. The rep was very emphatic about teaching me his role in the company and how he approached it. His mission was to give clients as much and as accurate information as he could, and to answer any questions they had on the products. It was simple as that; the message was education and service, not pressure to buy. It was a great way to do business and it is my great hope that all of the reps I deal with in practice operate that way. In the same trip I also got to take part in a product trial at a MAH research farm. It was very interesting to see the level of detail they require in administration of treatments and in recording the response data. I was also privileged with a complete tour of the extensive facilities at the farm, which were well equipped to perform a variety of different studies. On the way home we were able to talk to some university faculty about new MAH products and updates on production of others.

After getting back from Indiana I was able to drive North over the bridge to attend the Michigan Cattlemen’s Association Summer Round-Up in Sault Ste. Marie. This event was a great way to meet local producers and get new information on the industry against a Pure Michigan backdrop. One of the MAH employees gave a talk about current research into consumer trends in the beef industry, which was well received by the audience. I also helped talk to producers at the MAH booth in the exhibit hall, getting good practice in communication.

The next trip was to a beef slaughter plant in NE Utah. I met up with some meat science graduate students who had been contracted by MAH to collect data on cattle treated with a specific product. It was a great chance to see inside a phase of beef production that practicing veterinarians seldom experience. I was surprised, but reassured about the stringency of food safety rules in the plant. I had to go through a 30min food safety orientation before even entering the plant and there was always someone watching to make sure we were following the rules. It was also good to hear the beef packer’s perspective on how they view the animal health
field and its impacts on the beef product. As a side note, this is a beautiful area of the country and well worth the trip to see if you have time.

Halfway through the summer I was able to catch up with Dr. Bolton and we drove to Ohio for a consultation with a large dairy on vaccination protocols. They were having problems with respiratory disease and alternative protocols and products were discussed as a remedy. From that dairy we drove to Northern Indiana for a meeting with cattle veterinarians from the area. The veterinarians definitely had a different perspective on the products than the producers in the previous meetings and there was a much livelier discussion of the mechanism of the product and the data behind it. On the way home from this trip we swung by the Dairy Adventure at Fair Oaks Farm. Consumer outreach and education are becoming more important every day and this feature is a prime example of a successful program.

From there it was back to the airport and on to Nebraska to meet with a MAH technical services veterinarian on the beef cattle side. Dr. Bill Burdett was a great resource for knowledge on both veterinary medicine and the pharmaceutical industry. While there we visited the University of Nebraska Lincoln’s vet school program and talked with some of the faculty there about how it has been developing. We then called on a clinic to talk about new MAH products and answer any questions they might have. On our way to the next clinic we got an urgent call and had to re-route and get to Des Moines, IA to help with a producer meeting. After all this I still had enough time to make it to another veterinary clinic the next morning before I flew home. I had a very good visit with the owner of the clinic about how he built up his business by spotting unique opportunities and markets and exploiting them for the benefit of his practice.

At this point in the summer I had to take a short break from my duties as a MAH intern. Before taking the position I had scheduled a veterinary mission trip to Honduras. Although the trip required 2 weeks of my time, Dr. Bolton and MAH were more than happy to accommodate me. I was able to get the time I needed for what turned out to be an amazing trip. I mentioned that I had to have a lot of flexibility to work into the schedule for this position, but Dr. Bolton and MAH were flexible enough to make every trip work for both of us throughout the summer.

My last adventure for the summer was in Canyon, TX helping Dr. Ty Lawrence with a WTAMU meat science research project. The study involved taking a large number of samples from almost every part of a beef carcass. I’ll spare the gritty details of the project but it was very intense and the detailed data collected should prove very useful. This was a great end to my summer experience and Dr. Lawrence and his graduate students were very welcoming and taught me a lot about their project. My MAH Food Systems Fellowship took me around the country and I was able to participate in a lot of research projects and informational meetings. I am very thankful to MAH, Dr. Bolton, Dr. Grooms, and the FSF program for the opportunity to experience it all.
EREZ GUETA
MSU CVM Class of 2015

My summer experience with Michigan Department of Agriculture (MDA) TB Eradication program was everything I hoped it to be. It was important to me to experience, first hand, the work environment of public health veterinarians, while also accomplishing something meaningful that can make a difference, and help the TB program to advance; this summer fellowship allowed me to achieve both those goals.

My main responsibility was to conduct a wide literature research of worldwide publications regarding different possible vectors of TB. The whitetail deer (WTD) is the well recognized, wildlife reservoir of bovine TB in Michigan. However there are many other mammals and birds that are susceptible to M. bovis and have the potential to transmit it on to the cattle. The majority of farms (90%) in the northeastern lower peninsula (which is the TB core area) are what is called Wildlife Risk Mitigated (WRM), which means that farm biosecurity plans are in place to minimize the interactions of WTD with cattle, and their environment (feed, water, pasture). However, we still have about 2-3 herds/year that are coming down with TB. How do they get it? This question is what sparked my summer research. First we were looking into 5 other possible vectors: voles, mice, rats, geese, and starlings. However, as I was digging deeper into the literature research we modified that list. I was given the freedom to do so, using my own critical thinking, and the help and guidance of experienced people like Dr. Smith, and Dr. Vanderklok. The final list of vectors was: raccoons, opossums, voles, pigeons, and ticks. The TB program’s managers said that this work will have an impact on the way MDA approaches WRM, and will probably spark further research.

At MDA I worked under my direct supervisor Dr. Rick Smith, and I got to interact, and work with at least a dozen more highly skilled veterinarians. In addition to the literature research I conducted, I was exposed to many more aspect of the daily routine of public health veterinarians. MDA arranged for me to complete Biosecurity Level 3 (BL3) training and participate in sample collection from sheep carcasses at DCPAH for the Scrapie program. I also participated on the necropsy, and sample collection from 3 TB suspected cows. I had the chance to ride along with a couple of vets doing animal shelter inspections, and learning about the regulatory responsibilities that MDA has over the pet industry. I also participated on monthly “One Health” conference calls, with representatives from Michigan Department of Community Health, DNR, DCPAH, USDA, MDA, all sharing public health information, and trying to collaborate efforts.

One of the chief aspects of the TB program is the annual herd testing in the TB endemic area. Most interns get to spend a week up in Atlanta MI, where MDA has a permanent office, since surveillance begun in the late 1990’s. My week up in Atlanta was a memorable experience. I got
to help with a complete test cycle of 500 cattle head. From shadowing Dr. Robinson who injected the cows, to learning how to operate the MIMs data-base, and records, to ear tagging over 100 cattle with electronic tags, I feel like I got a good varied hands-on experience with TB testing. This large herd had different facilities, which the crew showed me how to operate in order to safely manage the cattle. We also had a variety of animals, from dairy cows, to beef cattle, to young Holstein bulls. In addition to the testing, I got to go with the wildlife biologist conducting an on-farm wildlife-risk-mitigation plan. We identified places of possible deer-cattle interaction and sharing of habitat. Then, together with the producer, we discussed how to address those risks. I also got to spend a day with the wildlife services trapper who does all the small mammals trapping around the northeastern farms. Talking to him, and the producers helped me understand which wildlife animals are most likely to interact with cattle and where. In turn, this helped me shape my work in the vector literature research.

Summer of 2012 was a busy time for MDA TB program. While I was working there we had two infected herds, a TB review by a national USDA team, and starting discussions on a new zoning order. Dr. Smith invited me to take part in all the meetings leading up to the review, discussions on how to handle the newly infected herds, and zoning order possibilities. I set on some great meetings with epidemiologists sharing their findings, laboratory experts from DCPAH, DNR officials, phone conferences with field veterinarians from up north and more. The one-week review process itself was very interesting to watch. Our state veterinarian, Dr. Halstead, led the entrance, and exit meetings, and overall MDA got excellent feedback on work well done.

All the people at MDA were very welcoming and made me, and the other two vet students working with them, feel very comfortable. They encouraged us to get involved with everything that MDA does, and let us pick their brain for hours to learn more about any topic. I feel very fortunate to have had the opportunity to work with such a great group of people. I would like to take this opportunity to thank the FSF program, and MDA for giving me, and other students, the option to get hands-on experience with our fields of interest. This will be very valuable in helping us shape our future careers in veterinary medicine. Thank you!
What do you think of when you hear the word team? Many people would think of their favorite sports team, others may think of a group of surgeons. When I hear the word team, I think of animal agriculture. This summer I had the opportunity to work for a company that truly embraced the team effort needed to further animal agriculture. This company was AntelBio of Northstar Cooperative. Northstar Cooperative’s mission is to “enhance producer profitability through integrated services,” and throughout the summer, I continually saw them living up to their promise.

In the early parts of my internship, I spent several days in training as well as at commercial meetings. It was here that I learned the intricacies of the company. I learned that Northstar Cooperative has many branches within the company: Dairy Herd Information (DHI), Select Reproductive Services (SRS), Select Mating Services (SMS), Select Sires, AI services, Universal Lab, sales, and a diagnostic branch (AntelBio). I could not get over the amount of services this company could provide a dairy producer. Also, at the commercial meetings, it was amazing to see that everyone in each branch was informed of the other branches progress and had the opportunity to voice suggestions.

After all the excitement of Northstar Cooperative, it was time to learn more about AntelBio. For the next couple weeks I observed the diagnostic tests AntelBio offered. I observed several ELISA
tests: Johnes, BVD, BLV, Salmonella, Serum PAG, progesterone, and NEFA. I also observed several PCR tests: contagious mastitis, BVD, and Johnes. I became familiar with all of these tests as well as the science behind them. It was amazing to see the integration of DHI, Universal Lab, and AntelBio. To summarize the process: a DHI tech would go to a dairy farm and take milk samples from every cow for a scheduled milking; then the milk samples would be shipped to Lansing at Universal Lab; Universal Lab would then test every milk sample for fat, protein, SCC, etc. Also, Universal Lab would set aside any milk samples that would need further testing by AntelBio. Then an AntelBio person would walk over daily, pick up the samples, and run the appropriate tests. All the information about the milk as well as the diagnostic tests, are uploaded via web and/or mail. It was impressive to see how many different branches worked as a team towards a common goal of providing the best information for dairy producers.

Over the next month I spent most of my time gathering and testing samples for the validation of a milk pregnancy test before its commercial release. For this project I went to two dairy farms: a large dominantly Holstein farm as well as a dominantly Jersey farm. At these farms I worked closely with the DHI technicians to gather the milk samples, as well as the producers to ultrasound the cows. Every cow that had a milk sample taken also had an ultrasound. Later, the ultrasound would be used as a gold standard to determine sensitivity, specificity, and accuracy. After all the samples were taken, I worked vigorously to aliquot the samples, freeze back three from each cow, enter all the ultrasound data, and run ELISAs on the milk samples. I ran the milk pregnancy test on all of the samples as well AntelBio’s commercial progesterone ELISA.

The last month of my summer was focused towards entering ELISA results and data analysis. In food animal medicine, many culling decisions and herd improvement goals will be biased on diagnostic test results, sensitivity, and specificity. Despite taking a course in Epidemiology, I struggled with this subject. Therefore, my supervisors and I made it a goal to have sensitivity and specificity interpretation become second nature. Instead of plugging all my ELISA results into a pre-existing program, I created excel spreadsheets that calculated sensitivity, specificity, and accuracy for the all the cows, for different stages of gestation, and for different breeds. The data was sorted and compared to the progesterone results. Then the progesterone results were compared alongside the milk pregnancy ELISA results to see if accuracy could be improved. For example, some disease negative cows (open cows) will be test positive (milk test pregnant). If the progesterone levels were low despite being milk test positive, it could be concluded the cow was in fact open and therefore improving accuracy. Through this analysis, it was amazing to see the versatility of excel. The AntelBio team is very familiar with its analytical functions and through their help in creating my own spreadsheets for data analysis; I feel I now have a strong understanding of sensitivity and specificity interpretation. I believe this skill will positively affect my future in the food animal industry.

In between working on the milk pregnancy validation trial, AntelBio had me help with other projects as well as get firsthand experience with the other branches of Northstar Cooperative. I
was responsible for collecting disease positive milk; heat treating it according to international standards, and then running the samples through AntelBio’s commercial assays. This was to help out other researchers that wanted international milk samples tested and were unsure if the extreme heat treatment would affect the assays. I also helped collect and test samples for ongoing bovine Leukosis prevalence study from a university. I spent the day with a SMS specialist where I learned how to evaluate the genetic merit of a cow and how to appropriately match her to a sire. I followed an AI technician for a day. Here I learned the art of detecting cows in heat. I never washed my boots so many times in one day, and it great to see such an emphasis on biosecurity. Also, I could not get over how well the AI technician, SMS specialist, and semen sales associate communicated and worked together towards the common goal of improving the dairy producer’s genetics. I was given the opportunity to sit in on a SRS meeting. In an SRS meeting, the specialist evaluates the farm on that day, and puts all the farm records through analysis program. Then the specialist, producer, nutritionist, and veterinarian all go over the results together and compare to the previous year’s results. Together they work to find solutions as well as brainstorm where potential problems may have occurred. I was impressed as to how thorough, quick, and professional the meeting was. It made me very excited to work for a company as well as an industry with such a team mentality.

It is very clear that my summer with AntelBio was jam-packed with many wonderful experiences. I have a greater understanding of epidemiological concepts such as sensitivity and specificity interpretation. Also, I have a new appreciation for the integration of the agricultural industry with veterinary medicine. Northstar Cooperative, especially the branch of AntelBio, is a strong asset to the food animal industry. Through their promise to “enhance producer profitability through integrated services” and their leadership to work as team, they have set an admirable standard. I hope that when I am a practicing veterinarian, I will follow their example and become a team player with my coworkers, my clients, and the agricultural industry.
I spent my summer working for the Michigan Department of Agriculture and Rural Development – Animal Industry Division. My primary focus was split between Eastern Equine Encephalitis (EEE) and Biosecurity at County Fairs. My work under the EEE program was primarily conducting surveillance phone calls to 87 veterinary clinics in the lower half of the Lower Peninsula biweekly from June through mid-August. Although no cases of EEE were found, there were two West Nile Virus (WNV) suspects, ten Equine Protozoal Myeloencephalitis (EPM) horses, several Potomac fever cases, as well as several other neurologic cases related to trauma and tetanus. In addition to making phone calls to local veterinarians, I also worked to update the brochures under the Equine and Companion Animal Programs, six total, as well as creating a flyer detailing the signs of EEE and encouraging horse owners to seek veterinary care if they see any neurological signs, as well as reporting any positive cases of EEE or suspected cases in which testing was not pursued. Throughout the summer I also created a Reportable Disease Booklet that showed signs of respiratory, neurological, and vesicular diseases in birds, cattle, goats, horses, pigs, and sheep. The booklet also described those diseases the appearance of those diseases, as well as how they are spread, and was intended for use at upcoming county fairs.

For fair biosecurity, I worked with Hanna Vecsernyes, the Intern working with the Aquaculture, Avian, and Porcine Programs to call 22 fairs that were occurring between June 18 and August 17, 2012. We offered them free Avian Influenza surveillance testing and a free biosecurity assessment, both covered by grants. Of the 22 fairs we called, we were able to attend seven, four were interested in participating but unable to at this time, three were not interested in participating at all, and we were unable to contact the remaining eight fairs. Biosecurity varied from fair to fair, with some fairs excelling in certain areas more than others. For the most part, we were pleased with what we saw. For the fairs that we attended, the most common causes for concern were: the lack of signage regarding risks associated with animals and hand washing the public bringing food, drink, bottles, etc. into animal areas; and animal waste and removal tools not kept in a location restricted from public access. Other measures that could be taken were more frequent disinfection of flooring, railing, equipment, etc., and encouraging exhibitors to not take any unused feed or bedding home from the fair as well as encouraging exhibitors to quarantine any animals they take home from the fair for two weeks. Things done well by the fairs included the education of the public about the animals and agriculture, no smoking signs posted in the barns, superintendent education to identify and reduce risks to the public, preventing ill animals from coming to the fairs, and keeping animal waste promptly removed.
Working for MDARD this summer also gave me the opportunity to experience the other program areas covered by MDARD. I was able to spend a week in the MDARD Field Office in Atlanta. The field office is located in the heart of the Tuberculosis zone, and I spent my time riding with the veterinarians of MDARD and USDA while the veterinarians tested the cattle for Tuberculosis, conducted wildlife-risk mitigation assessments, and spent time at the local sale yard. In addition to the Equine Program, Tuberculosis Program, and Fair Biosecurity, I was also able to participate in the Avian Influenza Surveillance testing occurring at the fairs and attend a couple Viral Hemorrhagic Septicemia (VHS) testing trips at fish hatcheries Gladwin and Gogebic counties. I wish to thank MDARD and everyone I’ve worked with this summer for providing these opportunities for Food Systems Fellowship students, and for allowing me to get such a broad experience in the Department!
I received the unique opportunity through the Michigan State University College of Veterinary Medicine Food System Fellowship to work with the Neogen Corporation this summer. Neogen has multiple locations in the United States and internationally that develops and manufactures products for food and animal safety. Forbes Magazine has repeatedly recognized Neogen in their annual list of Best Small Companies in America. The work discussed below was conducted under the direction of Dr. Jennifer Rice and Dr. Preetha Biswas in the Pathogen detection Laboratory at Neogen’s Center of Microbiological Excellence (CME) in Lansing, MI.

The first week of my internship, I was presented with the project to research different methods for the detection of the Gram negative enteric pathogen *Salmonella* in cattle feces. Multiple pairings of selective enrichment broths and selective agars were scrutinized to optimize detection and isolation of *Salmonella* in fecal samples. Salmonellosis is a highly contagious Gram negative bacterial disease that is commonly found in dairy calves one to ten weeks of age. It is also seen in adult dairy cows and beef cattle in particular ones having stressors such as parturition, hot weather, and poor nutrition. *Salmonella* also creates a serious economic impact on the producer associated with treatment costs, mortality, abortions, and reduced production from infected animals. Spread of *Salmonella* commonly occurs via the fecal – oral route from fecal contamination into feed and water by infected animal(s). Along with poor sanitation
methods, wild animals may act as a potential source of spread of *Salmonella*. Clinical signs in cattle include fever, dehydration, and watery diarrhea which may contain mucus and blood. Diarrhea is caused by a series of interactions between the pathogen and the host. It has been demonstrated that in *Salmonella* serovar Typhimurium, translocation of type III effector proteins into the host cells causes neutrophils to infiltrate into the areas of colonization due to the production of chemokine’s by the colonized intestinal cells. This results in acute inflammation and results in increased leakage of extravascular fluid causing diarrhea and fluid loss. *Salmonella* also has the potential to spread to other organs and become systemic. *Salmonella* also poses a public health concern being zoonotic; it can cause infection in humans from consumption of undercooked meat, contaminated water, and raw milk. Having such an impact on both the human and animal world having tests to detect *Salmonella* in a timely manner is critical.

The first method evaluated was *Neogen Reveal 2.0 for Salmonella* which allows for detection and presumptive identification of *Salmonella* within 24 hours from a variety of food products. *Reveal’s* lateral flow device combines an immunoassay with chromatography for a rapid and accurate one-step result in 15 minutes after enrichment. The test works by placing 200 ul of the enrichment culture into sample vials and then placing the *Reveal* strip into the sample for 15 minutes at room temperature. If the sample contains antigens, it will bind to gold-conjugated anti-*Salmonella* antibodies. The antibody-antigen complex will then flow through a nitrocellulose membrane which contains more anti-*Salmonella* antibodies. When the antibody-antigen complex comes in contact with the anti-*Salmonella* antibodies on the membrane, a visible line will form. A control line also will develop to verify that the test is running properly. Initially, *Reveal* tests on the cow manure directly from an enrichment broth yielded varying results from not flowing well up the device to false positive results. To address the flow rate issue, I tried different media and buffer combinations and found that a 1:10 dilution of the enriched sample in Phosphate Buffered Saline (PBS) addressed the flow rate problem. After having trouble with still obtaining false positives, *Reveal* was then used to test presumptive black colonies from Xylose lysine deoxycholate (XLD) plates that were suspended in PBS. The flow rate worked extremely well; however, there is a concern of the presumptive black colonies on XLD resulting in false positives with *Citrobacter* species. Instead of changing the *Reveal* device completely, I tried a different antibiotic that
inhibits *Citrobacter* at the enrichment step. I tested different amounts of the antibiotic supplemented to the enrichment broth that were spiked with *Salmonella* and *Citrobacter*. Here, I found what amount of antibiotic was needed to inhibit *Citrobacter*, yet allow *Salmonella* to survive and grow.

The second assay was ANSR for *Salmonella*, which uses an innovative isothermal DNA amplification process to amplify *Salmonella* DNA to detectable levels and fluorescent molecular beacon technology for detection of the pathogen target. Initially, problems arose with both the media and background flora present in cattle feces. To overcome these obstacles, many different methods were tried before I was finally able to test the fecal material and obtain accurate results. The sample was placed into small tubes after being enriched for 24 hours and a lysis buffer is added to the tube and placed on a heater block for 20 minutes at 80 degrees Celsius. After that time has elapsed, a portion of the lysed sample is placed into tubes with lyophilized ANSR reagents and then read by the reader which provides results after ten minutes. An internal positive control is always present in the assay; inhibitors present in the fecal material matrix were causing problems with the ANSR reaction. Once I had the device running, I then traveled to several farms and collected samples from different stages of cattle looking for *Salmonella*. It was extremely exciting when I found my first wild *Salmonella* sample after long days of sampling in the hot heat.

The individuals at Neogen provided me with an amazing learning opportunity and allowed me to sharpen up my laboratory skills. I have never had a summer fly by so fast but as they say time flies when you’re having fun. I now have a new respect for all the work that goes into designing and manufacturing the diagnostic tests that I have and will be using in my future as a veterinarian. Working at Neogen has also taught me how to design experiments to test different ideas, to troubleshoot, and how to analyze experimental results. I am extremely grateful to Neogen Corporation and the Michigan State University College of Veterinary Medicine Food System Fellowship Program that has provided me with this amazing opportunity and new skills that I will utilize in my career as a veterinarian.
Milk is one of the most highly regulated foods in the agriculture industry. This summer I had the privilege to spend some time learning Michigan Milk Producers Association’s (MMPA) part in keeping our milk safe. I learned how to do both routine and state inspections on farms to make sure they are in compliance with the Grade A milk standards. The main point of the inspection is observation focusing on the milk house, milking equipment, parlor, and water supply. We would always do a check on the cattle housing too, since this is such a big factor for mastitis management and prevention. Farm visits were also made for high pre-incubated (PI) counts, high raw bacteria counts, high somatic cell counts (SCC) and freeze points. Each of these different quality counts, are indicative of a milk quality problem. A freeze point below 0.540 shows that there is added water in the milk and the main source of a high PI is dirty equipment. These quality counts are useful in helping to determine the source of a problem on a farm.

With the objective to show consumers that dairy producers ensure cattle are cared for properly, the National Milk Producers Federation (NMPF) founded a program called FARM, which stands for Farmers Assuring Responsible Management. As of now, this is a voluntary program for MMPA producers to partake in. There is a 2-part process to the evaluation. First, there is a set of questions to ask to the producer and also a set to answer as you observe the facilities. The second part to the evaluation is scoring of the cattle for their hygiene, locomotion, body condition score, and
hock/knee lesions. There is no pass or fail to this program; it just documents that the farm had someone come to the farm, observe, and ask questions. I spent a portion of my time with the member representatives doing these evaluations to help to show to consumers that MMPA’s members take pride in the proper care of their cattle.

I also had an opportunity this summer to participate in a research study. A farm recently made the switch to using recycled manure solids from recycled sand to bed their freestalls. Since the change has occurred, the farm has had trouble with an increasing SCC and an uncommon organism, *Serratia spp*, causing mastitis. Because there is little known on how to manage freestalls like this, our goal was to help the farmer find a way to best manage his stalls while decreasing the bacteria load at the teat end. For 2 weeks, I worked the graveyard shift and took samples from the stalls at determined time points among the addition of bedding into the stalls. Once the samples were all collected, I worked with Dr. Ron Erskine (MSU CVM) and plated out the bedding samples, incubated and then counted all the bacteria growing. We determined that cultivation of the free stalls will have added cost in skid steer and labor use, but it will also increase cow comfort and have a possible benefit in reducing bacterial numbers in the stalls.

Mastitis management was another area I focused on this summer. I got to work with producers and do composite and quarter cow sampling for herd tests on their cattle to help them determine what pathogens they are dealing with. Also, I got to help write up mastitis management plans for producers with chronic SCC problems. Writing mastitis management plans are a balancing act. If you see too many areas of improvement for the farm you can overwhelm the producer with too much information so they do not want to make any changes. The key is to focus on a few major problems that will have the greatest impact and work on them slowly. Moreover, I also got to assist with doing MSPAP’s (Milking Systems Performance Assurance Program). With these, we used a Triscan to graph individual cows to see milk let down, the pulsation ratio, and vacuum levels to ensure optimum milking efficiency. Another important service that MMPA offers to their members is the CIP (Clean In Place) checks. Equipment needs to stay clean and be properly sanitized, so the CIP checks would help determine if the right amount of detergent, acid, and sanitizer were being used to keep the equipment clean and if the hot water temperature is sufficient and mechanics are working properly.

I also had a chance to become further involved in the dairy industry and promoting animal agriculture. In May, I went to the Michigan Dairy Industry Conference in Mt. Pleasant and heard numerous speakers discuss hot topics in the dairy world regarding meat and milk antibiotic withholds. I worked a booth at the Great Dairy Adventure at the MSU pavilion and taught kids how to properly wash and prep a cow for milking. They even had a chance to attach a milking unit to an “udder.” It was very rewarding to see all of the excitement from the kids about dairy! Furthermore, I volunteered at a Breakfast on the Farm at Goma Dairy in Marlette, Michigan. I taught both kids and adults the process of where the milk goes after it leaves the parlor.
Watching their amazement at how fast the milk was cooled from 100 degrees down to 35 degrees in less than a minute made them realize that milk is a highly regulated food source.

From driving thousands of miles all around the great state of Michigan, to meeting with producers from farms of all sizes, my summer with MMPA will be one that I always remember. I would like to thank MMPA and the Food Systems Fellowship for allowing me to be part of such a great opportunity. My experiences learned will help further my knowledge and make me become a better dairy veterinarian in the future.
Before this summer (2012) my swine experience consisted of working at Michigan State’s Swine Teaching and Research Center. I experienced everything from vaccinating animals, breeding, farrowing and helped with a few research projects. This was the image of the swine industry that I had in my mind whenever someone mentioned pigs. I also knew upon graduating from the DVM program that I could practice in swine medicine. However, it was not until my experience working at the National Pork Board that my eyes were opened to the endless opportunities available to me as a veterinarian.

My first few days at the office in Clive, Iowa consisted of meeting with the various departments including Administration, Communications, Producer Services, Domestic Marketing, Information and Technology, Science and Technology and the other services that reside within the office. In the first few days at the National Pork Board I received greetings and handshakes from every person I met and passed in the hallway. After getting settled into the office I met with the individuals in Science and Technology department (picture on right) since this is the area I worked in. Even though I was based in Clive I also worked jointly for the American Association of Swine Veterinarians (AASV). Through each of the companies I was able to use my current understanding of swine health and expand on my knowledge as I prepared technical factsheets for both NPB and AASV. These factsheets included various swine diseases and topics in public health and worker safety.
During the summer my work was split up between various people in the department. While I worked on the technical factsheets I also learned the art of webpage design as I worked with the IT and Communications departments to update several pages on the Pork Checkoff website. Much of the work I did focused on the Foreign Animal Disease and Public Health pages. One large project consisted of compiling publications and citations from Checkoff funded research from 2005-2009. This information will be vital for National Pork Board to determine the impact of producer’s Checkoff dollars.

Along with my work at the office I was able to attend several industry tours, meetings and a conference. Iowa State University held Swine Day on its campus, and I was able to go up to Ames and hear about some of the new research that will be evaluating various aspects of the swine industry including pit foaming, ventilation, economics and many other topics. Dr. Steve Larsen at the National Pork Board was instrumental in organizing several industry tours for both me and the other Science and Technology intern. We had the opportunity to tour a Tyson processing plant and a plant that processes sows. We also were able to compare these plants with a Hormel plant in Minnesota. There is no trip complete without visiting the Spam Museum! Iowa Select was gracious enough to allow us to visit one of their sow units and this was the first time I was able to see something that was bigger than four farrowing rooms. My summer experience was rounded out by attending the Swine Health and Animal Welfare Committee meeting in San Antonio. While here I had the privilege of sitting in on both of the committee meetings and listen to them discuss future projects that will impact swine health. We also had a tour of a feral swine holding facility and had a demonstration about the techniques used to catch feral swine.

This summer was not complete without seeing the Iowa countryside and having a road-trip with the other interns in the office to the Covered Bridges of Madison County, Leon Rodeo, the Field of Dreams, Amana Colonies, Badlands National Park and Mt. Rushmore. This summer experience with National Pork Board has been filled with a lot of new experiences and wonderful opportunities to expand my understanding of not only the industry but also the endless places and opportunities that a degree in veterinary medicine have to offer to my future career. I would like to end with a big thank you to National Pork Board and AASV for the wonderful internship this summer.
This summer I participated in the Michigan Department of Agriculture and Rural Development’s Viral Hemorrhagic Septicemia (VHS) USDA Grant as well as a High Pathogenic Avian Influenza (HPAI) surveillance program that helps monitor local, county and state fairs for HPAI. My job also included generalized training in aquaculture and training for the Incident Command System through the FEMA, a training system designed to help communities and professionals prepare for natural disasters and other emergency situations.

Initially, my internship consisted mostly of getting up to speed on various pathogens of concern for Aquaculture in Michigan, principally VHS. The virus is of the IV-b strain and is unique to the Great Lakes Region. This disease, which caused significant die-offs in 2005 and 2006, has spread through the Great Lakes and many inland natural water bodies in the region. Clinical signs include exophthalmia, petechial hemorrhaging on the external surface and internal organs, and a protruding vent. Because of the significant risks the disease poses to wild and cultured fish populations, stringent regulations have been enacted to prevent the spread of the virus. This included implementation of biosecurity measures such as quarantine, disinfection, and VHS testing protocols.

Other major aquatic diseases of concern in Michigan include Bacterial Kidney Disease, Enteric Redmouth Disease, Furunculosis, Whirling Disease, Infectious Pancreatic Necrosis, and Infectious Hematopoietic Necrosis. These diseases are reportable to the Department of Agriculture because they pose a significant health to wild and cultured fish populations as well as an economic risk to producers. Part of my job was to learn how regulatory bodies such as the USDA, Michigan department of Agriculture and Rural Development, and the Department of Natural Resources decide who can import fish into the state, stock public waters of the state, or move fish to other aquaculture facilities within the state. Proper documentation of biosecurity protocols and testing are essential to ensuring that we minimize the risks of spreading these diseases.

Another aspect of my training was gaining familiarity with the USDA Federal Order Regarding VHS. This federal response to the outbreak of VHS was issued in 2006 and affected the eight Great Lakes and potentially any state that had a positive test for VHS. I sat in on the discussion with various stakeholders on how to either modify the federal order or drop it completely and establish regional or state regulations sufficient to protect fish health in the region.

I also learned about efforts the State of Michigan is taking to encourage the growth of the aquaculture industry. They are currently in the process of publishing a How-to guide for
Aquaculture which provides a roadmap through the planning process for starting an aquaculture facility. This includes finding an appropriate site for the facility, designing a compliant fish farm, and trekking through the regulatory paperwork necessary to become licensed to operate. I also was responsible for researching the importation requirements of other states with significant aquaculture industries and developing a database that could assist Michigan fish farmers with developing testing protocols.

The other side of my position included training on Avian Flu and HPAI surveillance. High Pathogenicity Avian Influenza is serious viral respiratory disease that has the potential to wipe out entire poultry populations in a matter of days. While some strains of Influenza Virus Type A H5N1 appear to be endemic in poultry populations and be asymptomatic to mildly pathogenic, High Path Type A has been shown in to spread rapidly within poultry populations, cause high rates of mortality, and pose zoonotic risks to humans. Fortunately, HPAI has never been detected in United States poultry production. One reason for this is probably the success of the National poultry Improvement Plan, NPIP, which monitors for high risk poultry diseases like Avian Influenza and Salmonella pullorum.

Due to the risks associated with HPAI, it was my job to help with developing a plan for surveillance for AI in Michigan. I was responsible for drafting letters to fairs, inviting them to participate in AI testing and contacting fair personnel and poultry superintendents to schedule AI testing and biosecurity visits.

Once my initial training was complete, I went to various fairs to perform my AI testing. The procedure requires that you have testing media in sealable vials that is kept cool on ice packs, sterile swabs, and appropriate protective equipment for your team. Testing involved getting a tracheal swab for chickens, turkeys, and small game, or a cloacal swab for waterfowl. The swabs are then placed in the media and kept on ice till they are submitted to the lab for PCR testing. This surveillance was relatively low cost, non-invasive, and provided a means of sampling the local poultry populations from multiple regions of the state.

By midsummer, I was ready to do some VHS sampling at several fish farms. The process involved collecting the appropriate number of fish from each lot, so as to ensure a significantly relevant sample size, humanely euthanizing them using MS-222, aseptically collecting the liver, spleen, and heart from the fish, or collecting whole fish in the case of very small fish, packaging the correct number of fish in each sample container, and submitting them to the Fish Health Laboratory at MSU. During this process I also learned about fish health management, biosecurity procedures on aquaculture facilities, and performing a fish health assessment.

During the course of the summer I had the opportunity to tour fisheries and learn about the role of the DNR and stocking of public waters. I also completed some of the Incident Command System training required to become a member of the Michigan State Animal Response Team. This training included how to set up an effective team of community leaders and emergency
responders in the face of a natural disaster or emergency and specifically the role of animal care professionals in providing an effective means of protecting animal and public health.

In August, I traveled to Lacrosse, Wisconsin for the American Fisheries Society’s Fish Health Section Meeting. I learned about the genetics of resistant fish strains, new diseases and pathogens, new diagnostics for detecting fish pathogens, and opportunities for developing vaccines and other pharmacological agents for improving fish health. In Dundee, Michigan, I participated in a workshop on aquatic invasive species, business management, opportunities for aquaponics and aquaculture growth as an industry in the US.

I would like to thank my supervisor, Dr. Nancy Barr, for her support, and for providing me with so many excellent educational opportunities. I also thank Drs. Peggy Roth, Susi Baer, and Mike Brunner for their patience in training me in the field and all their encouraging words.

Sponsored by the MSU CVM FSF Program
This summer we were selected to participate in the Food Systems Fellowship India program. Six students, along with two professors, traveled to Chennai, India to conduct research projects for six weeks at the Madras Veterinary College. For most of us, this was our first time leaving the United States, and even our first time conducting research. The professors, students, and other veterinarians that we worked with, both at the college and out in the field, were incredibly welcoming and supportive of our research efforts. There were many things that were much different than the United States, like the very noticeable increase in the amount of traffic and people. It was exciting to try the different local foods, but at times they proved challenging as well. The streets were always full of life, and even with some
language barriers, we were still able to communicate and learn more about their culture and way of life. Our areas of research included: the prevalence of Brucellosis in cattle, prevalence of *Mycobacterium tuberculosis* and *M. Bovis* in cattle, Newcastle's disease in poultry, and economic losses due to Mastitis in cattle.

For our project which involved evaluating the incidence of Brucellosis in Chennai and neighboring villages, we collected blood and milk samples from cows in the clinic at TANUVAS and the villages of Thanjuvar, Dharmapuri, and Kattupakkam. We collected medical histories while paying special attention to the cows that were demonstrating clinical signs of actively shedding Brucella. Once the blood and tissue samples were collected, they were subjected to a Milk Ring Test (MRT), Standard Tube Agglutination Test (STAT), Enzyme-Linked Immunosorbent Assay (ELISA), Rose-Bengal Plate Test (RBPT), live culture, and Polymerase Chain Reaction (PCR). Upon testing completion of over 128 samples, 2 were found to be positive for *B. abortus*, and both showed clinical signs of Brucellosis. Overall, every one of us learned at least one new research technique, which will help us in our future endeavors.

Another part of our research projects was to look at the prevalence of Tuberculosis. Milk samples were collected from clinics at Madras Veterinary College, the Livestock Research Station (LRS), Kattupakkam, TANUVAS, and unorganized farms in multiple villages in the districts of Tanjore and Dharmapuri. We performed a PCR using the IS6110 gene, which detects organisms of the *Mycobacterium* genus. We also performed Multiplex PCR to differentiate *M. tuberculosis* and *M. bovis* on positive *Mycobacterium* genus samples. The PCR results demonstrated that there is some incidence of *M. tuberculosis* in cattle in Tamil Nadu, India. Interestingly, the only positive cases of *M. tuberculosis* were from cows brought into the TANUVAS large animal clinic. The samples tested from the organized and unorganized farms did not give rise to any positive samples.

We also conducted a project which involved evaluating the efficacy of a newly developed pellet vaccine against Newcastle’s Disease Virus (NDV). First, we went out to a village, Kancheepuram, where we collected blood samples from unvaccinated chickens and supplied
farmers with enough pellets to vaccinate their entire flock. Since most of us had dealt little with poultry, we took this opportunity to practice our venipuncture techniques and learn how to give pellets. It was a lot of fun interacting with the farmers and learning about raising poultry in rural villages. Twenty one days later, samples were again collected from the now-vaccinated birds. In the lab, we were able to run haemagglutination (HA) tests and haemagglutination inhibition (HI) tests to determine antibody titers for NDV. We performed were able to learn both laboratory techniques and learned the value of these tests. We were also able to participate in other tests being conducted in the lab, including running a Real-Time PCR. By evaluating our results, we were able to conclude that the vaccination significantly raises antibody titers to a level of resistance against NDV.

In addition to our projects involving sample collection and lab analysis, we also conducted a survey-style study to determine the economic losses due to mastitis. For this project, we visited farms in the state of Tamil Nadu accompanied by several translators, and collected information for a questionnaire that focused on family demographics, farm management, affected cow’s history, and losses associated with that affected cow. Some of the areas we focused on were losses in milk yield following mastitis, medication costs, veterinary fees, labor, and shortened lactation length. The numbers were then compiled and arranged into organized (those with 10 or more milking cows) and unorganized (those with less than 10 milking cows) farms. As expected, we found that mastitis had a significant effect on Indian dairy farmers, which is very similar to US dairy farmers. We felt the biggest surprise between Indian farms and US farms was the difference in farm management. Whether we compared sanitation practices or milking procedures, the similarities were few. We found communicating with the farmers to be the most difficult aspect of the project, but with a little patience and amazing translators, we were able to get all of the information that was needed.
Apart from working on our research projects, we were given multiple opportunities to travel different areas of India. The trips were always an adventure and allowed us a small taste of Indian transportation. We traveled on various types of buses, a train, and even boats. Our first trip outside of Chennai was to Thanjavur. This town is much smaller than Chennai, and we spent our time in the rural areas collecting samples for research. We were shocked when we showed up and realized that we would need to restrain the cows using only their horns and ourselves. On most of the trips we were able to go to the local temples to experience the Hindu religion. We visited a couple temples that are some of the largest and most famous in India. At one temple, we even got to sit on a temple elephant!

Our next trip was to the Kancheepuram district where we collected samples from the birds for our Newcastle project. Each farm was excited that we were there, and the appreciation of the bird owners was extremely evident. We spent some time exploring the sights in Chennai: the “shore” temples, the Bay of Bengal, a crocodile/snake park, the zoo, a lion and tiger sanctuary, and St. Thomas Basilica. We even got to attend a wedding and experience some of the rituals that are much different than those to which we are accustomed. We visited peripheral farms associated with the Madras Veterinary College and got to see all of the different agricultural animals. One farm had ostriches that we got to spend some time with, too. At the different villages, one of our favorite things to do was interact with the children living there. At first, they would be afraid of us and somewhat unsure, but eventually they would warm up to us and were very excited to talk to us and take pictures with us.

The traveling at the end of our trip got a little hectic, but the areas were definitely worth the time it took to get there. In one village, we got to take small, woven basket-like boats through a canyon with waterfalls that were breathtaking. We also traveled to the southern-most tip of India known as the area of the “tri-seas.” This is where the Bay of Bengal, Indian Ocean, and Arabian Sea all meet.
The monuments and sunset made for a fantastic day. At the end of our trip, we went to Mudumalai National Park and tiger reserve. There were a few different elephant camps that we were able to visit as well. This was an amazing experience where we got to safari through the park, studying the different wildlife present in India. We also went on an elephant ride around in the woods, which was truly unforgettable.

When we weren’t at the college or traveling, we had the pleasure of interacting with the students, faculty, and employees around the hostel. We really enjoyed playing basketball, going jogging, and learning to play cricket. We also had the opportunity to have henna/mehndi art drawn on our hands and feet by some student artists. There were multiple meals provided by faculty who were extremely hospitable and excited to host our group. Each and every person we met was extremely receptive of our group and their genuine kindness really showed. We developed some great relationships with those around us and will always treasure those memories.

All in all, India was an opportunity to learn. An opportunity to learn about pathogens we don’t usually deal with in the United States. An opportunity to learn about India’s agricultural industry. An opportunity to learn about a foreign, third-world, yet booming country. An opportunity to learn about an amazing culture so different than our own. An opportunity to learn a foreign language. An opportunity to learn about other veterinary students, both our American group mates and our Indian friends. An opportunity to learn how to go with the flow and that everything will work out in the end. But most of all, India was an opportunity to learn about ourselves, grow as human beings, and develop into better, more well-rounded, future veterinarians.
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