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 student’s education.

2014 marked the 9th year for the *Summer Food Systems Fellowship Program*. One hundred eleven 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 be successful.
Contents

Emily Schmitt-Matzen 1
Kurt Fennema 3
Chris Stretton 5
Samantha Ainsworth 8
Amanda Craig 10
Kim Bocchiaro 12
Christina Fenske 13
MSU CVM FSF Partners 16
Emily Schmitt-Matzen
Neogen Inc.

This summer I had the opportunity to work at Neogen’s Center for Microbiological Excellence in Lansing, MI. I was specifically working in the Pathogen Detection laboratory under the supervision of Dr. Preetha Biswas and Senior Research Scientist, Debra Foti. During the first week of my internship, I spent time practicing my microbiology laboratory skills and becoming familiar with the specific projects going on in the laboratory.

For the first part of my internship, I spent most of my time on a project working to develop and test efficacy of disinfectants for poultry houses. We were specifically looking for a type of disinfectant that would kill mold known as Aspergillus fumigatus. In poultry houses, this can cause respiratory disease and high mortality rates in chicks. Treatment after the birds present with respiratory illness is not effective; therefore, the prevention of A. fumigatus in poultry houses is key. While working on this project, I learned how to grow and harvest this particular mold spores in a laboratory setting, how to screen disinfectant formulas for their effectiveness, and many Environmental Protection Agency (EPA) standards associated with antifungals to be used on hard surfaces. Since these results would eventually be submitted to the EPA, certain guidelines needed to be followed. These guidelines were set forth in experimental protocols known as Good Laboratory Practices (GLP). Prior to this experience, I was unaware how strict and specific the EPA and GLP laboratory practices and regulations were. Particular details needed to be recorded during all stages of disinfectant testing. While this was quite the task, I am glad these standards exist to ensure the safety and quality of disinfectant products.

Halfway through the summer, I started learning about on-farm culture techniques used to help with the diagnosis of mastitis pathogens. Mastitis is inflammation of the udder in dairy cows. There are many reasons this can occur, but if it is due to an infection caused by gram-positive bacteria it is best to treat the cow with antibiotics. Gram-positive bacteria can be highly contagious, especially Staphylococcus aureus; therefore timely intervention will reduce potential economic losses. However, mastitis can also be caused by a gram-negative bacterial infection and in this case, it is best to sequester the animal and let the infection clear on its own. Once a cow is on antibiotics it cannot be milked for a certain period of time costing the dairy farm revenue. The antibiotics have a cost as well; therefore it is to
the dairy farms advantage to only treat cows that need to be treated. The on-farm culture techniques using a bi-plate agar system is commonly used to determine which type of bacterial infection a mastitic cow has, if any.

The traditional culture method uses two types of agar, one that gram-negative bacteria will grow on and one that all bacteria, both gram positive and gram negative bacteria, will grow on. If there is growth on the agar used for gram-negative bacterial growth, then the infection is thought to be gram negative. If there is little to no growth on the agar used for gram-negative agar and growth on second type of agar that will grow either bacteria, the infection is thought to be gram-positive, and the animal should be treated with antibiotics. During this project, I obtained milk samples of mastitic cows from Michigan State University (MSU). These samples originally came from a number of farms around the state of Michigan, and I was unaware if the milk sample came from a cow negative for any infection or from a mastitic cow. Using the methods described above, the sample was determined whether it was from a cow with a gram-negative infection, a gram-positive infection, or free of infection. The results were then compared to MSU’s results. Additionally, while there are some common strains of bacteria causing mastitis, there are also some odd bacteria strains one could find in mastitic milk, such as *Trueperella pyogenes*. I studied how these organisms grew and appeared on agar culture plates.

Finally, I worked on the validation of a product known as NeoFilms. This product was developed by Neogen to detect pathogens and other microorganisms in food. The dehydrated culture medium on a film, an alternative to using traditional culture plates, are easy to use and store, and can screen for microorganisms such as *Escherichia coli* and *Staphylococcus aureus*. With the NeoFilms, you make a ten-fold dilution of your sample in a buffer and then place 1ml of the dilution on the NeoFilm and incubate it for 24-48 hours. For this project, I plated different bacterial strains at different dilutions on the NeoFilms and recorded the appearance and colony counts on each type of film.

Overall, my experience at Neogen has been very rewarding. Prior to this internship I worked in a microbiology laboratory at MSU, but this was a unique experience where I was able to build upon my previous skills and gain valuable knowledge about the food safety industry. I found Neogen to be a fantastic company that cares about the quality of their products and works closely with food producers and other researchers to ensure their products are as useful and reliable as possible. I would recommend this internship to anyone wanting to learn more about the development and use of products that help keep food and animals safe.

95% of Michigan farms are single-family operated or family partnerships. Of the farms structured as corporations, 99% of those are family-owned and involve multiple generations and family members.
I spent my summer working for the Michigan Department of Agriculture’s Animal Industry Division (MDARD). This was a position offered through the Food Systems Fellowship program organized by Michigan State University. I was offered this position by Dr. Mike Neault, program manager for MDARD’s emergency response system, and Dr. Nancy Barr, program manager for MDARD’s avian diseases, swine diseases, and aquaculture. My primary project through MDARD was avian influenza surveillance. Throughout this project I called many county fairs all over the state of Michigan. The surveillance program is completely voluntary so I only attended fairs that gave us permission. When I called the fairs I explained to them the importance of making sure bird flocks and waterfowl are free of avian influenza and how their participation is crucial to the success of this project. If they agreed to participate then I would send out consent forms and informational flyers about avian influenza to the fair. The poultry superintendent distributed these documents to poultry and waterfowl owners to sign in order to give us permission to test their birds. I would then head to those fairs with a field veterinarian. We went to the fairs’ poultry barns to do the testing; here we would take one bird at a time, open their mouths and collect an oropharyngeal sample with a polyester swab. I then put the swabs in media and took them to the Diagnostic Center for Population and Animal Health. The lab would then perform PCR tests for avian influenza and fax MDARD the results. I compiled all results in an excel sheet to keep for records for MDARD. In all the years that this project has occurred there have been zero avian influenza positive results, which was consistent with my findings as well.

My secondary project was to count fair animals as well as count ear tag ID in those animals. Every animal entering a fair must have proper ID for the county fair as well as proper ID according to State and Federal regulations. I would take note of the number of dairy cattle, beef cattle, sheep, goats, and swine; I would then count the amount of those animals that did not have proper ID and report them to MDARD. There was no enforcement for a lack of ID, but it was noted and will be used to consult with the fair on how to improve biosecurity for the following year for each fair. In addition to animal ID I also helped field veterinarians assess biosecurity protocol at the county fairs. We would document how many hand washing stations there were, as well as what kind of signs were posted about personal safety and hygiene. This is very important at fairs.
because people can touch all the animals, which may be carrying potentially zoonotic pathogens that can make people sick.

During the summer porcine epidemic diarrhea virus (PEDv) was declared a reportable disease by the United States Department of Agriculture (USDA); there were a lot of meetings, discussion and planning in order to organize and execute the guidelines set by USDA. I had the opportunity to be involved in these discussions. Dr. Barr asked me to research best practices on biosecurity to prevent and/or contain PEDv on farms; this information would be distributed to farms that had problems with PEDv on their farms.

MDARD received a call in May from a farmer with concern about a high mortality rate of his poultry flock. I was able to attend the farm with a field veterinarian to collect dead specimens, which we submitted to DCPAH. The poultry veterinarian was pretty sure after his initial workup that the flock had Infectious Laryngotracheitis (ILT), a reportable disease. This was a very serious situation because a total depopulation would be required if ILT was confirmed. We returned to the farm later to analyze logistics on how to perform a depopulation on site. After lab confirmation the results turned out to be a combination of bacterial infections. One of particular importance was *Mycoplasma gallisepticum*, another reportable disease. I was asked to research biosecurity protocol for *M. gallisepticum*. Eventually this information was used in a meeting with field veterinarians at DCPAH.

Aside from these main projects I had the amazing opportunity to go out in the field with several different field veterinarians. I toured the Michigan Department of Community Health (MDCH) and met several veterinarians there. I visited a meat rendering facility due to a complaint of smell and excessive flies in the surrounding neighborhood. We inspected the business to make sure they were in compliance with regulations established for meat rendering facilities. I got to visit two DNR fish hatcheries up north to see how they raised fish and released them. I was able to take a tour of a slaughterhouse with a USDA FSIS veterinarian. Here I saw how pigs were humanely slaughtered and processed for food. I also had the opportunity to visit a cattle auction and assisted in the tracking of every cow entered and sold at the auction through USA Herds. I assisted a couple of field veterinarians with Tb testing in beef cattle. One cow was submitted to DCPAH for necropsy due to a suspect Tb reaction. I was given permission to attend the necropsy on the BSL-3 necropsy floor.

Aside from animal and regulatory experience I also had the opportunity to attend Ag Expo in East Lansing, MI to speak to people about biosecurity. I assisted in The Great Dairy Adventure in the Pavilion with other Food Systems Fellowship participants; here we had a dairy cow with a cannula. We would explain to visitors how the cannula was implanted and why cows have cannulas. My summer with MDARD and experience with FSF have been amazing, helpful and eye opening; my understanding of the One Health concept has become more clear and personal. My passion and enthusiasm for the field has grown greatly. I have learned a great deal and am excited to use the experience in my career.
This past summer I was fortunate to be chosen as an intern with Merck Animal Health (MAH). This position is made possible through the Food Systems Fellowship and is put on by the Michigan State University College of Veterinary Medicine (MSU CVM). I started my summer adventure at a few local dairy farms and a feedlot here in Michigan. I was still unsure at this point what I was going to be working on this summer, but I wanted to learn as much as possible so I went into everyday with an open mind and a willingness to learn. I soon met a few of the core people I would be working with throughout the summer including my summer mentor Dr. Michael Bolton from MAH, Dr. Dalen Agnew from the Diagnostic Center for Population and Animal Health (DCPAH), and Dr. Daniel Grooms from the MSU CVM. We traveled to these local farms together and met with a few others and I soon got a better idea of what my summer had in store for me. MAH was putting together a protocol for how to perform a digital necropsy on a beef animal and a dairy calf. A necropsy is the same thing as a human autopsy, but is performed on animals. To facilitate this, Ashley Gaudet, a necropsy specialist from southern Alberta was flown in to be the “star” of our project. The idea was to film her performing necropsies on various beef animals and dairy calves in order to be used as a teaching tool for others to learn how to perform a complete field necropsy. This was a great anatomy refresher and I was able to assist in filming and performing parts of the necropsies. Little did I know this was quite the foreshadowing for what I would be doing throughout the rest of my internship.

After working on the digital necropsy project for my first week, I was informed I would be heading to Okotoks, Alberta to learn from Ashley Gaudet and the rest of the consultant assistants (CA’s) and veterinarians that work for Feedlot Health Management Services (FHMS). According to their website, FHMS can be described as a “comprehensive beef industry consultancy, providing veterinary services, herd health programs and computerized health-recording systems and other informational tools to producers throughout western Canada and the United States.” I spent ten days with FHMS and took in as much as I could. I rode along with multiple CA’s learning how to perform the same necropsies I had seen Ashley do just weeks beforehand. Each CA had their own technique on how best to perform a necropsy while also taking digital pictures for use in making diagnoses later by the
veterinarians. FHMS has been performing these digital necropsies since the 1980’s and the MAH necropsy protocol was modeled after their techniques, so it was only fitting that I learn from the best. Their philosophy is simple, rather than having veterinarians drive all over performing time consuming post mortem exams, they have CA’s perform the necropsies and take pictures at the same points and from the same angles during every procedure. This makes everything more standardized and allows for a trained veterinarian to observe the pictures and make a diagnosis quite quickly. Besides learning to perform a complete field necropsy, I absorbed as much information from the veterinarians and CA’s as I could while in Canada by asking countless questions and getting constantly quizzed on various diseases and pathologies.

My next destination was West Texas A&M University (WTAMU) located in Canyon, Texas. My main contact here was Dr. Ty Lawrence and I was going to assist with a drug feeding trial being performed by one of his graduate students, Ms. Lee Anne Walter. The goal of the trial was to compare beef animals that had been fed a certain drug to those that had not been given the drug. We followed these animals from the feedlot, into the slaughterhouse, and through full fabrication into the cuts of meat that you buy from the store. During this trial every bit of the animal was weighed and recorded for use in the study. Other measurements were also taken including rib eye area and a marbling score. This trial was performed through the WTAMU Meat Laboratory and I worked closely with the students that manage it. Upon leaving Canyon I had become familiar with the workings of a meat lab, a meat-processing plant, and all the various cuts of meat. I had also acquired excellent butcher skills and was able to make some awesome friends.

After leaving Texas, I had a bit of a break until I was to travel to my next destination. This was nice as it allowed me to relax and catch up with online coursework and visit my hometown to see my family and friends. But it was soon time to fly out again. Next stop, Tulare, California. Tulare is home to a large calf ranch client of MAH. My goal here was to learn as much as I could about the workings of the farm while also teaching their technicians how to perform a digital necropsy. This was my first teaching experience of the summer and I was excited to share what I had learned. Being a calf ranch, these animals were a lot smaller than the ones I had become accustomed to in the feedlots of Canada, but it provided an excellent educational opportunity for both the technicians and myself. A dairy calf necropsy is very similar to a larger beef animal necropsy, but there are some minor differences related to their age and physiology.

My next trip was the longest of the summer and was composed of two trips in one. First, I flew to Denver, CO to attend the Bovine Respiratory Disease Symposium and the annual Academy of Veterinary Consultants meeting. These two events were combined into a five-day conference filled with talks on the latest news in bovine respiratory diseases as well as many other current topics of interest in the cattle world. This was a great opportunity for me to talk with veterinarians and students from around the country that shared similar interests. At the conclusion of this conference, I gathered up my things and headed to Garden City, Kansas. I was
to meet up with a few MAH veterinarians and get introduced to the vast feedlots and calf ranches of southwest Kansas. My goal here was similar to the one I had in Tulare; teach the veterinarians and technicians how to perform digital necropsies on their animals. What made Kansas unique however, was that the farm I was working with was enormous and was made up of three different feedlots as well as a calf ranch. I would ride along with the main farm vet in the mornings and then teach necropsy techniques in the afternoons before the trucks would come to haul away the dead animals. By this time in the summer, I had become pretty comfortable in my methods and started to really enjoy sharing these skills with others. As morbid as it may sound, performing a necropsy gives one great insight into what caused the death of an animal and it is a very powerful tool in animal management, so it is nice to work with people who are enthusiastic and want to learn more.

My last trip brought me to Wisconsin and Vermont. This was a rather shortened visit compared with the others as we wanted to complete some training, but only had a small window of time available in each location. I landed in Green Bay, WI on a Monday afternoon. At this point, I had roughly two full days till I was to fly to Vermont so I had to make the most of my time. Before getting to WI, I had prepped the farm and veterinarians I would be working with as best as possible so that things would run smoothly for us during our long instruction day. Just as in my other trips, I arrived at the training farm and started teaching digital necropsy protocols to technicians and veterinarians alike. After everyone was satisfied and felt as if they had a firm grasp on the methods and concepts, we parted ways and I hopped on a plane the next morning headed to Burlington, Vermont. I had never been to that part of the country and I really didn’t know what to expect. Upon arriving however, I quickly understood why people love living in this area as it is very beautiful and has a lot to offer. The agenda in Vermont was similar to that of Wisconsin, but I was going to be working with a larger group and we were going to be performing necropsies on full-grown dairy animals. I had never performed a necropsy on a dairy animal but I knew it had to be fairly similar to a beef animal. Much to my relief things went smoothly, although I came to learn the hard way just how bony and tough a full grown animal is, much less a dairy cow. And so I left Vermont after having been there for less than 48 hours and finally made my way back to Michigan for the rest of the summer. This concluded my travels and internship with Merck Animal Health and I couldn’t have asked for a better experience. I learned more about anatomy, pathology, management, diseases, and cattle in general than I could have ever hoped for. I am extremely grateful to MAH for this amazing opportunity, to Dr. Michael Bolton for being an outstanding mentor, to all those veterinarians, technicians, and students that taught me so much, and to Dr. Daniel Grooms for making such a wonderful program possible to the students of the MSU CVM.

Michigan has 380,000 dairy cows, representing approximately 1,900 dairy herds, and ranks 7th in milk production in the U.S.
I spent the initial first few days of my internship reading background information about Bovine Leukemia Virus. This allowed me to better understand the actual disease and the adverse effects it has on the dairy industry. I also was able to read the grant proposal to better educate myself about the specifics of the study. At this point that was about all I could do with the study until it got a bit further into the summer.

So I started observing some of the various tests that are run at AntelBio. I started off watching various ELISA assays that included Johnes, BLV and pregnancy. After watching and learning about the assays through NorthStar Cooperative’s online learning center I performed all three of these tests. From here I moved on to learning about their PCR tests. I observed the fecal, BVD and mastitis PCR from start to finish. I then went on to perform the mastitis PCR. I was supervised step by step the first few times I went thru it and was then able to perform the test on my own.

Also while waiting for the project to take off I rode along with a couple employees of AntelBio and NorthStar. I spent two days in the thumb of Michigan riding along with a DHI technician. Here I learned how they go about collecting milk for testing. While I had seen this many times at my own farm it was very interesting to see how it was done on very large farms. I also rode along with an A.I tech for one day in the Grand Rapids area. This was also very interesting because I was able to see this done on a couple larger farms as well. I also learned more about different kinds of heat detection systems I wasn’t quite as familiar as some of the other systems.

In the middle of June I was able to attend the Select Sires Employee Orientation located outside Columbus Ohio. I spent two days there learning about various aspects of the company. I learned about the different services the company can offer to a dairy and beef farmer. I was also able to see many of their prized bulls in their Bull Parade.

Now it was a fit farther into the summer so it was time to get things going on the BLV study. I set up meetings with Dr. LaDronka, the graduate research assistant, to discuss how she saw the project going. At the same time Todd Byrem started making phone calls to the different GM’s of various DHIA organizations to introduce them to the study. From here I drafted an email and letter that was then sent to all the GM’s to invite them to attend a webinar. The webinar was held at the end of June. We had a very good turnout and everybody except one agreed to participate in the study.
After the webinar I sent out a few follow up emails and phone calls to gather the information we had asked the GMs to provide us with. At the same time we started receiving milk samples from farms in Michigan. It was my responsibility to save samples of the milk, test the samples, and create and keep track of all the test results in a spreadsheet. By the time my internship finished we had the names of technicians that were going to be used for 9 of the 11 states. They also had milk samples collected from 7 of the 10 Michigan herds, so everything was well underway when I left.

Overall it was a great experience. Everyone at AntelBio and NorthStar were very friendly and more than willing to help you out and spend their own time teaching you. Through this internship I gained more confidence in making phone calls to strangers and also to superiors. I also gained a deeper understanding of what kind of work needs to go into setting up national study. Additionally I learned what BLV was and how it affects cattle far more than initially believed. I would definitely recommend future students to participate in an internship at this company.

**Michigan Agriculture Facts**

- Michigan contributes $101.2 billion annually to the state's economy, second only to the auto industry
- Michigan farms and the commodities they produce account for $13 billion of the overall total
- The livestock and dairy sector has the greatest direct economic impact at $4.73 billion
- In 2013, Michigan exported more than $3.2 billion of agricultural products to Canada, Mexico, Korea, China, Taiwan and beyond
- Total employment in the Michigan's Food and Agriculture system (including direct, indirect, and induced) is 923,000
- The total employment impact accounts for about 22 percent of the state's overall employment
- Michigan produces over 300 commodities on a commercial basis, the second most diverse agriculture portfolio in the USA
Amada Craig  
Michigan Dept. of Agriculture and Rural Development

This summer, I had the wonderful opportunity of working with the Michigan Department of Agriculture (MDARD), Animal Industry Division, through MSU College of Veterinary Medicine's Food Systems Fellowship. My immediate supervisor was the Program Manager for Companion Animals, Equine, and Reportable Diseases. I was given a variety of projects to work on throughout my twelve weeks with the Department.

My first project was to develop a survey to distribute to veterinarians that work with our animal shelters, to collect information on how they approach shelter medicine and what they feel needs to be improved. I first visited about 35 animal shelters around the state, collecting names and contact information for any and all veterinarians that the shelter worked with. MDARD requires a vet of record in order for a shelter to become registered, but we were interested in knowing all veterinarians that were working with our shelters. The remainder of the shelters that I was unable to get to (at the time there was a total of 184 registered animal shelters in the state) I called and/or emailed to gather their veterinarian information. I then worked with my supervisor and the Animal Shelter Program Manager to develop a brief survey that was first sent to a pilot group of 5 veterinarians. Feedback was obtained, changes were made, and the survey was distributed to the shelter veterinarians via Survey Monkey and email. The survey also asked if the veterinarians would be interested in working with MDARD in a future Animal Shelter work group. Data collection was just wrapping up as my internship was ending, so I was unfortunately not present for the data analysis.

My second project was West Nile virus (WNV) surveillance in equines. MDARD and the Department of Community Health received a grant from the Centers for Disease Control (CDC) to use towards WNV surveillance for the summer. We also tested samples for Eastern Equine Encephalitis (EEE), and if applicable, Rabies virus. I first developed a mailing that was sent to equine veterinarians throughout the state via various channels - MEPA, AAEP, VetNet, etc. I then created a database of as many Michigan equine veterinarians as I could find, which included their contact information for future correspondence regarding the surveillance program. I developed a reporting spreadsheet for the program and was the main contact for veterinarians with neurologic horses and suspected WNV cases. By the end of my internship, we had 4 serum sample submissions, which were sent to the Diagnostic
Center for Population and Animal Health (DCPAH), and no positive WNV cases. Had there been any brain samples submitted, I was to be the one to collect them and transport them to DCPAH. Before I left, I helped put together WNV kits for field staff that would potentially have to collect samples in my absence. These kits included items such as large coolers, garbage bags, absorbent paper, scalpel blades, paper towels, and ice packs.

My third project had to do with biosecurity at horse shows. I first created a database of horse shows around the state - dates, times, locations, contact, etc. I did a lot of research on biosecurity, particularly at horse shows and in relation to equine infectious diseases. I developed a brochure regarding biosecurity practices and its importance, to be distributed at horse shows in the future. I visited 5 large horse shows around the state - the Michigan Quarter Horse Association harbor Classic, Horse Shows by the Bay, the Michigan Foundation Quarter Horse Show, the Michigan Small Equine Club horse show, and the Tri-State Pinto horse show - to observe and make note of any current biosecurity practices or lack thereof, to get a general idea of what all of our horse shows need to improve on.

My last project involved checking for animal ID at fair. My first three projects took precedence over this one, so I only had time to get to one fair this summer. I joined my fellow intern, Kurt, at the Ionia Free Fair, where I helped him collect samples for Avian Influenza testing. We also walked through the animal barns and counted cattle with and without RFID tags, as well as noted whether or not swine had official ID.

Along with my assigned projects, I was encouraged to join field staff on their various assignments. I accompanied several staff on their annual animal shelter inspections, during which I also gathered veterinarian information for my project. Other activities included animal shelter complaint follow-ups, investigation of a possible Brucellosis outbreak in a puppy that attended puppy classes, tuberculosis testing certification, drug residue investigation, RFID checks at a livestock market, aquaponics facility pre-licensing inspection, Avian Influenza testing at a Chucker production facility, and complaint follow-up at a meat packing facility.

I was also able to attend multiple meetings and work groups with my supervisor, other program managers, field staff, and the state veterinarian. These included the Michigan Annual Communicable Disease Conference, CAMET Emergency Shelter Trainings, MDARD AID division meeting, Rabies Work Group, Investigative Training at DCPAH, Field Staff meeting, MDARD Commissioner’s meeting, the AgExpo at MSU, and a One Health Networking Event, also at MSU.

I am very thankful for the experience at MDARD. I made wonderful connections and loved the variety of projects I was able to work on. As a dual degree DVM/MPH (Masters of Public Health) student, I believe this was a great fit for me, and I highly recommend the position to any veterinary student, regardless of your future interests. Thank you to MDARD and the Food Systems Fellowship for such an amazing opportunity and an exciting summer.
After photo identification and a series of thorough background checks I was all set for my first day at the Zoetis Richland farm site. I was stationed in a BSL-2 facility. I got comfortable quickly with acronyms like standard operating procedures (SOP), general health observations (GHO), good laboratory practices (GLP), and Institutional Animal Care and Use Committee (IACUC). Familiarity with industry lingo and abbreviations quickly followed. A typical day at Zoetis included multiple showers, personal protective equipment (PPE), swine and cattle study support, and learning something new. I assisted with animal receiving, husbandry, handling, vaccinations, challenges, injections, fecal swabs, nasal swabs, clinical observations, euthanasia, and necropsy. Animal care technicians, managers, and veterinarians who take pride in their work trained me in an encouraging learning environment. I participated in pre-study meetings and weekly staff meetings, assisted in laboratories downtown and at the farm, designed a study protocol, participated in a discovery study alongside senior veterinarians and immunologists, and assisted on occasion with small animal study support. The internship allowed freedom to explore different avenues within the company. I met multiple veterinarians who fulfill a variety of roles and learned of potential career paths for veterinarians in industry. Interns are invited to attend lunch and learn sessions, field trips, and networking events. The company goes to great lengths to teach their successful models for the discovery, development, manufacturing, and marketing of veterinary vaccines and medicines.

As I continue to participate in diverse areas of the profession I find myself in places I never thought I would be. Working at Zoetis reinforced my interest in advancing the food production industry as a future veterinarian. I realized my own creativity as a budding veterinary scientist and found a passion for food animal welfare. I chose to be a part of the profession to contribute to discoveries in human and animal medicine including novel vaccines, drug alternatives, and research methods. This year I will be assisting with swine and cattle welfare, immunology, and microbiology research at Michigan State. I have aspirations of completing a comparative medicine and integrative biology masters in conjunction with my veterinary studies. The masters will help me gain a working knowledge of current research methodology. Upon graduating veterinary school I would like to practice in the food production industry and potentially continue my research to the PhD level. Zoetis has been pivotal in guiding my next steps in the field of veterinary medicine.
Co-operatives are groups of people working together for the betterment of all. Michigan Milk Producers Association (MMPA) is a member-owned milk processing and marketing co-operative. The organization has the responsibility of ensuring a market and payment for their members’ milk. To do this successfully year after year, they provide resources and field services that help farmers produce the highest quality milk. Currently, they serve 2000 members and handle over 4 billion pounds of milk annually. MMPA is a leader in the dairy industry, helping farmers produce and sell one of the safest and most nutritious food products in the world. Each summer, Michigan State University (MSU) College of Veterinary Medicine and MMPA partner together under the Food Systems Fellowship program to offer one veterinary student an opportunity to gain experience in the dairy industry and carry out a coordinated research project. I had the honor of being chosen as this year’s summer intern.

I had limited exposure to the agricultural industry prior to this opportunity. My internship with MMPA was filled with a variety of experiences that gave me an incredibly thorough base of knowledge about the dairy industry. In the first few weeks, I rode along with several field representatives from all over the state of Michigan. I witnessed the tremendous benefit that MMPA producers receive by having field reps that truly care about their success and do everything they can to ensure it. These individuals are responsible for things like routine inspections, milking equipment checks, tank calibrations, and problem resolution. They troubleshoot high somatic cell counts (SCC), pre-incubation counts (PIC), and raw bacteria counts (RBC) to help producers maintain Grade A quality milk. High numbers can indicate a problem with the milking equipment or bulk tank, clean in place (CIP) units, cooling equipment, cow health, or even employees using improper procedures like extended lag times and over milking. To assist with identifying sick cows, I was taught how to use the California Mastitis Testing (CMT) paddle to determine which quarter of a cow’s udder has a high SCC level and is likely to be infected. This lets producers know which cows and which quarters to treat with antibiotics. Field representatives also perform SNAP testing for antibiotic residues in both bulk tanks and individual cows if the producer suspects its presence and wants to get the milk tested before
the hauler arrives. It is important to troubleshoot and solve problems quickly on dairy farms so that producers can make management decisions that will prevent issues in the future.

Other responsibilities of field representatives include environmental enhancement through Michigan Agriculture Environmental Assurance Program (MAEAP), Energy Audits, and National Dairy Farmers Assuring Responsible Management (FARM) program evaluations. FARM was designed to demonstrate the industry’s continued commitment to providing high-level care for dairy animals. It includes guidelines for all aspects of an animal’s care, such as nutrition, housing, handling, and health care. Currently, over 70% of the milk supply in the U.S. is provided by producers that voluntarily participate in this program. FARM is an excellent way to educate farmers about best practices and reassure consumers about the welfare of dairy animals. Since I have a great interest in animal welfare, I welcomed the opportunity to complete training and become a certified evaluator.

Throughout the summer, I was able to visit and observe practices at different sized farms varying from 20 cows to over 2,000 cows. Every dairy operation is managed differently, depending on the owner’s preference, the resources available, and the veterinarian that works with them. I was able to see Amish, organic, conventional grazing, and conventional non-grazing farms. I also learned about the different types of parlors ranging from stanchion barns and parallel parlors to rotary parlors and robotic milkers. It was interesting to see the increase in robotic milking units across the state and to talk to producers about the potential pros and cons of this big leap.

MMPA also offered me opportunities to learn more about the dairy industry at meetings, conferences and tours throughout the summer. The first was a PCR diagnostics seminar where I learned about how polymerase chain reaction can be used to identify specific pathogens in milk samples. This knowledge helps producers and veterinarians choose targeted antibiotics to help reduce broad-spectrum antimicrobial resistance. I also attended Milker Training School that MMPA offers as a benefit of membership. This training explains to owners and their employees why specific milking and dry off procedures are important. It emphasizes how they can play a role in preventing mastitis, which is an economically important disease in the dairy industry.

During a tour of the milk processing plant in Ovid, I learned how liquid dairy blends, butter, and dry powdered milk are made. Attending the 4-H Milk Marketing Tour at the MMPA headquarters in Novi gave me the opportunity to learn more about the operations and obligations of dairy co-operatives, which included an informational session about their on-site milk testing lab. Quality control is a high priority, and all milk loads are tested for components, antibiotic residues, somatic cell counts and bacteria counts before being processed into the dairy products we know and love. Attendees were also treated to a tour of Michigan Dairy, a large manufacturing and bottling plant operated by Kroger. Other meetings I attended included a dairy industry exclusion review and an advisory committee meeting,
where I listened to discussions regarding current affairs that directly influence MMPA and its members.

My primary responsibility this summer was to complete a study investigating intramammary teat infusion protocols and their potential impact on mastitis. This study began last summer and is a coordinated effort between MMPA and Dr. Erskine at the MSU College of Veterinary Medicine. There were 24 farms originally enrolled and split evenly into a control group and a program group. The program group farms were given specific protocol training on proper intramammary infusion techniques, while the control farms did not. It is well documented that proper cleaning of teat ends prior to intramammary infusion is critical to reducing the risk of new infections. The study aimed to assess compliance with intramammary infusion protocols, determine the causative pathogens of clinical mastitis during the summers of 2013 and 2014, and compare infection rates between the control and program farms. I was tasked with visiting each farm, where I observed milking and dry off procedures as well as reviewed other management processes such as housing and lactating treatment protocols. I was responsible for recording any differences in processes from last year as a way to identify procedural drift. The farms were also asked to obtain an aseptic sample from each cow in the milking herd that presented with clinical mastitis. I picked up these samples throughout the summer and delivered them to the MSU lab. There, I learned how to plate milk onto culture medium and then read the results after proper incubation time. Common pathogens found thus far include *Staphylococcus spp.*, *Streptococcus spp.*, and *Klebsiella spp.*. We also tested for unusual pathogens, such as *Prototheca* and *Mycoplasma*. Since each farm was required to participate for 10 weeks, the study will officially end on August 23, 2014. Once all samples have been cultured and results obtained, we will be able to run the numbers and determine the final results of this study.

In addition to the research project and educational activities, MMPA generously allowed me opportunities throughout the summer to connect with people, learn more, and give back to the community. I was able to attend the Annual Beef Cattle Welfare Symposium, which included many snippets of wisdom that also apply across the dairy industry. I volunteered on the 4-H State Awards Selection Committee, at the Miracle of Life barn at the Ionia Free Fair, and at Breakfast on the Farm at Crandall Dairy. At the Great Dairy Adventure at MSU, I participated in an educational activity showing children how to prep a cow and attach a milking unit properly. Using a fake udder, we let the kids practice and educated them on how important it is to clean a cow before every milking. I had a great time with all of these experiences because I really enjoy meeting new people and have a growing passion for educating the public about the agricultural industry.

Being completely green going in, I learned more than I could have ever imagined about the dairy industry. This experience has made me a more knowledgeable consumer, and I believe it will make me a better veterinarian in the future. As an added benefit, I got to travel around this beautiful state and meet dairy farmers that are passionate about what they do. I am deeply grateful to MMPA and the MSU Food Systems Fellowship for giving me this opportunity.
<table>
<thead>
<tr>
<th>Partner</th>
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