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Poultry Diagnostic and Research Center
College of Veterinary Medicine
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➢ Q & A with Dr. Catherine M. Logue

Interviewed by Roel Becerra

Tell us about your background and how you got into Avian Microbiology.

I am a classically trained bacteriologist with a focus on meat microbiology, so I have spent a lot of my career working on meat production animals. When I started my career in the US, I wanted to focus on beef and *E. coli*. But, the best laid plans always go wrong, and no sooner than I had started in academia, the beef plant where I was supposed to work was shut down. I needed to pivot, and my colleagues were able to point me in the direction of turkey production in Minnesota and North Dakota. For 12 years I was able to do a lot of work on *Salmonella*, *Campylobacter* and *E. coli* in production birds and at slaughter. I was fortunate to be able to make some great collaborations with colleagues in the grower and processor industries in the Midwest. Lesson leaned: your best laid plans are not always what you expect, and you need to be prepared to change and move with it.

What are your research interests? What areas would you like to focus on with future research?

My current research interests are *E. coli* and *Campylobacter* in poultry. We have some really nice work looking at agents, including metals, that are used to control pathogens. We have been modeling their growth and behavior, and studying their pathogenesis and genome sequences. We also have some really neat work in *Campylobacter* that I am really excited about, as we try to understand the impact of *Campylobacter hepaticus* on poultry health. This has been an exciting project that we are working on with Dr. Roel Becerra, an MAM student of our program at PDRC. We currently don't really know a lot about *C. hepaticus* so this project is clarifying how the pathogen infects chickens and what that means for controlling it. It's exciting to see where it goes next. For future research I tend to go where I see a need – right now I see emerging changes in *E. coli* that are causing disease. We also see the emergence of *C. hepaticus,* so these areas are helping to drive our research agenda.

What has been your favorite bacteria/s to work on?

Ooohhh … that's a tough one. I have worked on so many from *Salmonella* to *Campylobacter* to *Staphylococcus*, *Yersinia* and *Listeria* to mention a few but I think one of the most versatile and challenging is *E. coli*. When I teach vet students, I tell them it's the Swiss army knife of the bacterial world. It can cause so many different diseases in various hosts from colibacillosis in poultry to urinary tract infection in animals and humans to meningitis in neonatal infants. What could be a more challenging or interesting than something that can do all that? There are so many avenues that still need to be understood and explored. I think it's a multipurpose bug to work on.

What are the most important research findings in your lab and how these findings will help the poultry industry?

We were among the earliest research groups to study *Salmonella* and *Campylobacter* in turkeys, and identify potential contamination points on the slaughter line. We also identified strategies for sampling large carcasses since most turkeys can weigh over 20 lbs which makes whole carcass sampling a challenge. We have reported many studies of antimicrobial resistance in pathogens from poultry and understanding how the pathogens harbor these traits, be they on mobile elements or chromosomally located. We have identified potential sources of *C. hepaticus* on poultry farms, and we have studied how to model the disease with the goal of developing a better understanding of means to control outbreaks at the farm level. We have contributed genomes for scientific research, and we still keep chasing interesting findings. One of the interesting avenues right now also includes understanding the organisms that cause Focal Duodenal Necrosis (FDN) in laying birds. My grad student, Yu Yang (Jerry) Tsai, has been trying to dissect out the disease in laying birds using state of the art methods. It will be interesting to see what he has discovered so watch this space….

How do you see yourself best serving as a valuable resource for the poultry industry?

I think the value is in relaying the findings of our research to the industry and hopefully helping them understand what is occurring and how. Recently, we have been looking at the evolving serogroups of Avian Pathogenic *E. coli* (APEC) that are causing disease, and this may help with understanding the impact of vaccines on the disease strains out there.

I would also hope that industry folks could tell me of their needs and concerns. This is really how the work in *Campylobacter hepaticus* came about. We realized it was emerging, and wanted to get an idea of how it could be impacting producers.

What are your interests outside of microbiology?

For fun, I am an avid photographer. My big interests are the birds of Florida and I spend a lot of time on the national refuges photographing these birds. My biggest find earlier this year was to get some beautiful photos of roseate spoonbills – they are a sight to behold, and their shocking pink color is amazing. I also like biking and walking as a means to disconnect, and it helps to keep me sane.

What is your approach to teaching microbiology?

When we get new students in the lab, I try to have them learn "hands on" rather than a lot of theory up front. Then, as they progress, the theory comes into play. I find that the experience for the student is better, and they are more confident. At this point in my career, I have trained many students at the high school, undergraduate, graduate, and professional level. But they all start the same way, and the approach seems to work well. What also works in class is making the disease and bugs real. Where are students likely to see it, and what are the consequences? What does it look like beyond the pages of a book or a slide? Last year, as I was teaching *Campylobacter,* I showed CDC data on an outbreak. Afterwards, I had a student come to me to discuss the case, and she was able to tell me she was part of the data. A real case in my class – a perfect teachable moment.

Based on personal experiences, what advice would you give to young scientists to be successful as researchers?

Having advised a lot of young researchers over the years I always say something along the lines of "jump in, learn lots, enjoy it, and there is never a silly question in our research group – that's how we learn. And finally, bacteria don't grow 9 to 5, and they never read the rule book". So, if you are interested in research, step out of your comfort zone, talk to the researchers/professors you are interested in working with, and volunteer to get time at the bench and see if it becomes your passion. If it does, then it will be a satisfying career.

So, for aspiring researchers, take advantage of opportunities that may be a little outside the scope of what you want. You never know where it will lead you career wise. If you enjoy what you do, then it's a good day's work. Be proud of what you find/achieve and write it up as you go. There is nothing finer than sharing your research with peers. And finally, there will always be challenges such as rejected grants and papers. Learn from the rejection, then dust off and get back at it. But, most of all, find your passion. If you do, it will be rewarding.

Dr. Catherine Logue received her undergraduate degree from the National University of Ireland, her post graduate degree from the Institute of Food Science and Technology, United Kingdom, and her PhD from the University of Ulster, United Kingdom, specializing in meat microbiology. She has worked as a researcher and scientist for state and government agencies before moving to the US where she was a faculty member in the Department of Veterinary and Microbiological Sciences at North Dakota State University (NDSU) from 1999 to 2011, rising through the ranks to full professor. She was a founding member of the Great Plains Institute of Food Safety at NDSU. In 2011 she moved to Iowa State University where she was a Professor of Microbiology in the Department of Veterinary Microbiology and Preventive Medicine, College of Veterinary Medicine, and also served as the college's Director for Faculty and Staff Advancement and Equity. In 2017, she moved to the College of Veterinary Medicine at the University of Georgia, as a Professor of Microbiology in the Department of Population Health, PDRC, and she also serves as the Assistant Dean for Faculty Affairs. Dr. Logue specializes in the detection and characterization of pathogens from food animal sources and the antimicrobial resistance of these organisms. She has extensive research programs in pathogens of human and animal health; she has published more than 100 research articles, book chapters and reviews, and has received in excess of 6 million dollars in federal, state and commodity funds for her research program.

➢ Interesting Topics at WPDC and ECVC 2022

Reviewed by the MAM Students

Campylobacter Hepaticus **in the Production environment/Stagnant Water as a Potential Source of** ***Campylobacter*** **Causing Spotty Liver Disease in Free Range Laying Hens in Georgia, USA.**

By Roel Becerra

This case report presented in Western Poultry Disease conference 2022, Vancouver, Canada. The author talked about spotty liver disease (SLD) which has emerged as an important cause of disease in layer (egg-producing) birds in countries such as the United Kingdom and Australia. In the USA, SLD has been found in the Midwest and Southeast. The organism implicated in the disease, *Campylobacter hepaticus*, causes focal lesions on the livers of infected birds, reduced egg production, decreased feed consumption resulting in reduced egg size, and increased mortality of highly valuable hens. In the fall of 2021, birds from two flocks A and B of organic pasteurized laying hens were submitted to the PDRC to diagnose possible SLD in the flocks. Necropsy of flock A, 5/6 hens had multifocal foci lesions on the liver and were PCR positive for *C. hepaticus* on pooled swab samples of liver and gall bladder. On necropsy of flock B, 6/7 submitted birds had spotty liver lesions. Pooled bile swab samples from two live hens from flock B were PCR positive for *C. hepaticus*. Follow-up visits to flock A were conducted, and a flock where SLD has not been reported (flock C) was used as a comparative control. Samples of the liver, spleen, cecal tonsil, ceca, blood, and gall bladder from 6 hens per house, as well as feed, water nipple swaps, and environmental water (stagnant water outside the house), were collected from the affected farm and the control farm. To detect the organism, all samples were subjected to enrichment in Preston Broth and culture under microaerobic conditions. After multiple phases of bacterial culture purification from all samples, single bacterial cultures displaying characteristics of *C. hepaticus* were tested with PCR to confirm identity. Flock A, liver, cecal, cecal tonsils, gall bladder, and environmental water were PCR positive for *C. hepaticus*. Interestingly, flock C,

where there have not been reports of *C. hepaticus*, found that the feces, liver, spleen, cecal, gall bladder, and environmental water were also PCR positive for *C. hepaticus*. After another follow-up visit, ten weeks later, flock A was again PCR positive for *C. hepaticus* only in gall bladder bile; however, flock C was PCR negative this time for *C. hepaticus*. Currently, there are no approved treatments, and no vaccine is available for *C. hepaticus*. These results suggest that *C. hepaticus* may be endemic in some areas of the USA, and free-range laying hens may be exposed from the environment/stagnant water in areas where they range. Nevertheless, the pathophysiology and how hens are contracting *C. hepaticus*, and if it is endemic are still not well understood, warranting further investigation. Currently, there are no approved treatments, and no vaccine is available for *Campylobacter hepaticus*. Producers have been treating organic and no antibiotic use layer hens with critic acid, oregano, apple cider vinegar, and other acidifiers in the water. However, to the author's knowledge, there is limited to no research available supporting best approaches for the control of *C. hepaticus* in these organic or no antibiotic ever layer hens. To the author's knowledge this is first report of *C. hepaticus* in Georgia, USA.

Assessing Broiler Breeder Pullet Live IBV Vaccination Programs Using qPCR and ELISA.

By Dr. Maggie Thompson

The purpose of this surveillance project was to better understand the application efficacy of various broiler breeder live Infectious Bronchitis Virus (IBV) vaccine programs implemented in the pullet phase using qPCR (choanal cleft swabs) and ELISA (fresh sera). We sampled pullets immediately prior to the first live vaccination, most commonly at 2 weeks of age, to determine exposure and/or challenge prior to vaccine administration, and then again 7 days after each live IBV vaccine administration. On average, most participating complexes administered 3 to 5 live IBV vaccines per flock. Choanal cleft swabs were obtained and qPCR using the complete IBV panel offered at PDRC was performed to evaluate vaccine takes. This panel includes the universal (+/-) primer as well as primers for Mass, Ark, Conn, Del072, GA98, GA13, and DMV1639. Additionally, sera samples were collected at various time points for ELISA to evaluate antibody response. Results of our project revealed significant opportunities in live vaccine application, as qPCR results were suboptimal (<50% "takes") in all participating complexes. Additionally, serological response was highly variable and did not produce a consistent rise in antibody titer following subsequent live vaccinations.

So, can we achieve better results? We have worked with an individual complex outside the scope of this specific project to monitor vaccine application of all live vaccinations, including Reovirus and Infectious Bursal Disease Virus (IBDV) as well as IBV and Newcastle Disease Virus (NDV). We have evaluated different application methods, including all coarse spray administration, all drinking water administration, spray administration of IBV and NDV alongside water administration of Reo and IBDV, etc. Preliminary data shows that, at 2 weeks when pullets were still in brood, >75% takes were achieved when IBV/NDV were administered via course spray while simultaneously administering IBDV/Reo via drinking water, immediately after a period of water restriction. Thus, perhaps adjusting our application methods to achieve a more controlled application results in improved vaccine takes and therefore duration of protection.

Variables impacting IBV vaccination

by Isabella Hannay

At ECVC, I presented the results of two studies which considered various aspects of IBV vaccination in the hatchery. My first study investigated the impact of thaw time on frozen GA08 vaccine. The study involved 4 different thaw times; 2, 10, 30 and 60 minutes in a 25C water bath. Each of these vaccines was diluted in distilled water to a working stock, and these stocks were used to vaccinate 100 chicks each in a standard hatchery spray vaccine cabinet. Choanal cleft swabs were taken at 1-week post-vaccination and qRT-PCR was performed on these samples to evaluate vaccine take. The results showed that the average amount of virus detected in the chicks didn't change between the 2- and 10-minute thaw times, however, the average viral load in chicks did

decrease in the 30- and 60-minute thaw time groups by 1 and 2 logs respectively. Additionally, the variation in the amount of virus within each group of vaccinated chicks increased as thaw time increased. Interestingly, previous work has shown that there is not any difference in vaccine titer when comparing 2- and 5-minute thaw times, and there was also not a difference in vaccine takes when chicks were vaccinated with those vaccines. So, from this data, we see that prolonged thaw times have a larger impact on vaccine efficacy, with 10 minutes being the point where the impact begins. The next study considered the impact of combining different GA08 and Mass vaccines. It has been proposed that, in the field at least, certain vaccines may inhibit each other though this has not been seen in laboratory studies. Since the most common combination of IBV vaccines currently used is GA08 and Mass, and these have been implicated for inhibition, we tested the two commercially available GA08 type IBV vaccines in combination with three different Mass type vaccines from different manufacturers. Vaccines were diluted to a working stock and chicks were vaccinated with a commercial spray cabinet as before. Once again, choanal cleft swabs were taken at one-week post-vaccination and the samples were analyzed with qRT-PCR. This data set was analyzed for both respective viral load and the percentage of birds positive for each vaccine virus. The data demonstrated that there was some influence of one vaccine type on the other, with the GA08 vaccines showing dominance over the weaker Mass type vaccines. The differences in vaccine take data could be due to interference, attenuation level, or vaccine titer, and needs to be investigated further. Regardless of the reason the interference may be occurring, we can use data like this in the future to make decisions on which vaccine combinations to use when creating vaccination strategies.

The next step for this series of studies will be looking at the impact of individual variables involved in vaccine application. It has been well demonstrated that there are multiple potential pitfalls in the spray vaccination process, but which one is the most influential has not been pinpointed. In the next experiment, we will isolate the droplet size (by changing nozzles) and the application volume to determine which component has a larger influence on vaccination efficiency.

➢ Wishing good luck to the MAM 2022 candidates as they start externships

Maggie Thompson

Maggie was born and raised in Opp, Alabama, home of the famous Rattlesnake Rodeo.
Personal Mantra. "*The number one motivator for people is avoiding discomfort. In order to grow, you have to get comfortable with being uncomfortable".* – John Maxwell

Isabella Hannay

Isabella grew up on several sheep farms across England and Ireland.
Personal Mantra. "*Do what you can, with what you have, where you are".* – Theodore Roosevelt

Roel Becerra

Roel was born in a small town located in Zacatecas, Mexico.
Personal Mantra. "*Live the present, study the past, and plan the future".* – Anonymous

➢ Meet the 2023 MAM Candidates

Maurice Andre Raccoursier

Maurice Raccoursier, Chilean, Doctor in Veterinary Medicine graduated in 2007 and Master of Science in Poultry Science from the University of Arkansas in 2016. He managed the commercial broiler farm of the University of Arkansas and his research was focused on broiler welfare and coccidia. He has 13 years of experience in poultry in the areas of laying hens, incubation, and breeders. Starting in 2008 and for 6 years, he worked as the veterinarian for the Chilean's Hy Line distributor where he was responsible of technical management of breeders, hatchery, and technical service to egg producers. Then, in 2014 he moved to Arkansas to pursue a Master of Science in poultry science from the University of Arkansas where he graduated in 2016. His research was focused on broiler welfare and coccidia, along with his responsibilities as manager of the university's commercial broiler farm. After graduation, he worked for two years in Hy Line international in GP/GGP production and as hatchery manager and between 2018 and 2022. He was a member of the global technical service team at H&N International. Married to Carolina, and father of three beautiful kids: Emma 9, Nicolas 6, and Benjamin 3. His interests are spending good time with the family, working out, old history and politics.

Edward Reece Bowers

Reece is from Dawsonville, Georgia and graduated from the University of North Georgia with a Bachelor of Science in Biology. After graduating from his undergraduate studies, he worked as a Consumer Safety Inspector with USDA Food Safety and Inspection Service in a poultry processing plant. It was in the processing plant where his love for the poultry industry began and sparked his desire to go to veterinary school. He received his Doctor of Veterinary Medicine from the University of Georgia with an emphasis in poultry medicine. Reece is eager and excited to begin his journey as a Master of Avian Medicine candidate at the University of Georgia's Poultry Diagnostic and Research Center. Reece enjoys a variety of outdoor activities including fishing, hunting, golf, and tennis.

Ashley Hallowell

Ashley Hallowell is a proud Penn State alumnus and graduated with a Bachelor of Science in Veterinary and Biomedical Sciences in 2013. After graduation, Ashley completed a one-year contract position with the United States Department of Agriculture, Agriculture Research Service researching food safety interventions and where her passion for food safety began. Ashley then worked for Aramark, a food-contract company, as a Senior Food Safety Specialist while completing her Master of Science in Food Safety at Michigan State University College of Veterinary Medicine. While enrolled at MSU, Ashley learned more about the role veterinarians play in safeguarding the food supply from farm to table. Her final master's project on alternative methods to antibiotic usage in poultry to reduce Salmonella and Campylobacter in broiler chickens ignited her combined interest in food safety and production medicine within the poultry industry. She received her Doctor of Veterinary Medicine at the University of Pennsylvania with a focus in poultry production. She is excited about the opportunity to join University of Georgia's Poultry Diagnostic and Research Center as a Master of Avian Medicine candidate. As a poultry veterinarian she hopes to put the puzzle pieces together to solve management and disease issues, but also educate producers on practical and economical tools to prevent health related challenges that may impact the food supply. Outside of chicken work, Ashley enjoys exploring dining and brewery options, watching Philadelphia sports teams (Go birds!) and playing field hockey.

➢ Useful Links:

PDRC Diagnostic Services Homepage

PDRC Diagnostic Lab Test & Fee Catalog

PDRC Diagnostic Lab - Domestic Submission Form