UNIVERSITY of GUELPH

ONTARIO AGRICULTURAL COLLEGE

DEPARTMENT OF ANIMAL BIOSCIENCES

PhD Defence

Ecology of Antimicrobial Resistance and Investigation of Berry Pomace Alone or in Combination with a *Lactobacillus* Isolate as Alternatives to Antibiotics in Broiler Chickens

Philip Mak

Date: August 4th 2023 at 9:00am

The PhD Defence for Philip Mak has been scheduled for August 4th, 2023 at 9:00am. The defence will be held online via Teams and in room 141: https://teams.microsoft.com/l/meetup-join/19%3ameeting_NmMzNTU2MDAtMjViNS00ZjYxLWI2ODctNjFlOGFlZWZlODlh%40thread.v2/0?context=%7b%22Tid%22%3a%22be62a12b-2cad-49a1-a5fa-85f4f3156a7d%22%2c%22Oid%22%3a%22fbd28915-dda5-478f-8ecb-a3682dcf0c3a%22%7d

The exam committee will consist of:

Examining Chair: Dr. David Huyben

Advisor: Dr. Elijah Kiarie

Advisory Committee Member: Dr. Julang Li

Additional Committee Member: Dr. Nicole Ricker

External Examiner: Dr. Claudia Narvaez

Abstract:

Antimicrobial use (AMU) in broiler production is highly regulated in many countries due to antimicrobial resistance (AMR) concerns, resulting in the use of alternative products including probiotics and phytochemicals. There are many studies that investigated the impacts of AMU on AMR in broilers, but there are limited studies evaluating how alternative production systems such as organic and raised without antibiotics (RWA) impact AMR. First study investigated AMR and gut microbiota profiles of broilers raised in different feeding programs: conventional (CON), raised without medically important antibiotics (RWMIA), and raised without antibiotics (RWA). Antimicrobial-resistant *Escherichia coli* was prevalent in all three feeding programs, where sex-specific differences in AMR to ciprofloxacin, tetracycline, and gentamicin were observed. Gut microbiota analysis revealed significantly different cecal community diversities and bacterial taxa between feeding programs. Specifically, *Enterococcus* was more abundant in RWA compared to other programs, in which females abundance was higher than males. Second study evaluated the *in-vitro* characteristics of *Lactobacillus reuteri* isolated from broiler ceca for their probiotic potential. Lactic acid bacteria (LAB) strains were identified as *L. salivarius*, *L. johnsonii*, *L. reuteri*, and *L. crispatus*, where they demonstrated tolerance and stability in harsh conditions, autoaggregate, and bind to hydrophobic surfaces. *Lactobacillus reuteri* demonstrated the best probiotic characteristics, with low prevalence of antimicrobial resistance genes (ARGs) and no virulence genes. Reuterin (*L. reuteri* bacteriocin) exhibited antimicrobial activity against Gram-negative and Gram-positive bacteria and was stable while exposed to digestive enzymes and other harsh GIT conditions. The third study evaluated the *in-vivo* impacts of *L. reuteri* in broilers alone or in combination with cranberry and blueberry pomaces on anti-coccidial effects, growth performance, and AMR. Growth performance, body parameters, lesion scores, and oocyst counts revealed that broilers fed berry pomace in combination with *L. reuteri* showed potential in controlling coccidiosis while maintaining performance. Gut microbiota analysis revealed *L. reuteri* was more prevalent in market weight broilers fed the combination.