UNIVERSITY of GUELPH

ONTARIO AGRICULTURAL COLLEGE

DEPARTMENT OF ANIMAL BIOSCIENCES

PhD. Defence

An exploration of in vitro methods to characterize impacts of nutraceuticals on equine gastrointestinal physiology

Jennifer MacNicol

Date: May 24th 2022 at 9:00am

The PhD Defence for Jennifer MacNicol has been scheduled for May 24th, 2022 at 9:00am. The defence will be held online via Teams: https://teams.microsoft.com/l/meetup-join/19%3ameeting_ODc0YmM2MTQtODI3OS00Nzg2LTg5MzYtZjc2M2MwYzdkNWMz%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. Julang Li

Advisor: Dr. Wendy Pearson

Adv. Committee Member: Dr. Emma Allen-Vercoe

Additional Graduate Member: Dr. Elijah Kiarie

External Examiner: Dr. Angelika Schoster

Abstract:

Three studies were conducted. In the first study, the influence of a simulated digest of a dietary supplement on the contractile response of gastric smooth muscle to acetylcholine (Ach) was evaluated. Porcine gastric smooth muscle was collected and established in organ baths with either a simulated digest of the supplement (FA), a blank digest with no supplement (BL), or a PBS control (CO). Increasing concentrations of Ach were added and contractile force measured using an isometric force transducer. In FA the mean force 1min post addition, the area under the curve 2 and 8min post addition were higher at lower concentrations of Ach than either CO or BL. These results indicate a potential sensitizing effect of the supplement to cholinergic stimulation within smooth muscle.

The second study evaluated the influence of a simulated gastric digest of the same dietary supplement on mucosal secretions was evaluated using gastric organ culture. In this study gastric mucosa from porcine stomachs was cultured in the presence of either a gastric digest of the dietary supplement (DF), a blank gastric digest (BL), or sterile PBS (CO) for 72h. Explants were stimulated with carbachol or PBS and culture media was sampled at 48h, 60h, and 72h and assayed for interleukin1-beta, nitric oxide (NO), and gastrin. The blank digest attenuated gastrin release in response to carbachol and reduced NO secretion. The addition of the supplement appeared to mediate these responses, potentially indicating tissue sensitization under acidic conditions.

The third and fourth studies evaluated the use of different methods to sustain an *in vitro* cecal environment and investigate the impact of a symbiotic supplement. Equine cecal fluid and fecal material were used to inoculate vessels maintained in an anaerobic chamber or chemostat batch fermenters. The supplement was added to treatment vessels and samples were taken at vessel establishment, 24h, and 48h and microbiome and metabolite analysis performed. The microbial and metabolic profiles between sample types differed. The microbiome of cecal inoculum maintained in the anaerobe chamber and chemostat were similar although the metabolite concentrations differed. Metabolite concentration was higher in treated vessels but the microbiome was similar to untreated vessels.