UNIVERSITY of GUELPH

ONTARIO AGRICULTURAL COLLEGE

DEPARTMENT OF ANIMAL BIOSCIENCES

PhD. Defence

Development of the Indicator Amino Acid Oxidation Technique for the Determination of the Minimum Methionine Requirement in the Domestic Cat

Julia Pezzali

Date: November 8th 2022 at 8:30am

The PhD Defence for Julia Pezzali has been scheduled for November 8th, 2022 at 8:30am. The defence will be held online via Teams and in 141: https://teams.microsoft.com/l/meetup-join/19%3ameeting_Yzg3MTVhNTEtZWNmZC00YmNiLWIxY2MtZTUzMzU0MGU3YjVj%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. John Cant

Advisor: Dr. Anna Kate Shoveller

Adv. Committee Member: Dr. Marica Bakovic

Additional Graduate Member: Dr. Allison Duncan

External Examiner: Dr. Aulus Carciofi

Abstract:

Empirical data on the requirement of dietary indispensable amino acids for adult cats are lacking. Current recommendations for the majority of dietary indispensable amino acids for adult cats are extrapolated from growing kitten studies, with exception of methionine and lysine. The minimum methionine requirement proposed by regulatory agencies is based on one study in which an insensitive technique for mature animals was used. Methionine plays critical roles in the metabolism, and hence, the use of more sensitive techniques, such as the indicator amino acid oxidation, to accurately determine the minimum methionine requirement in adult cats is essential to ensure feline health. Thus, the objectives of this thesis were 1) to develop a safe and palatable semi-synthetic diet limiting in methionine to be used in methionine requirement studies in cats; 2) to investigate the effect of methionine source and levels on diet preference and plasma amino acid concentrations; 3) to develop the indicator amino acid oxidation technique in the domestic cat, and 4) to apply this methodology to determine the minimum methionine requirement in adult cats. A semi-synthetic diet with inclusion of intact ingredients was successfully developed. No detrimental effects on the physiological parameters assessed were observed during short-term feeding and the diet was well accepted. No preferences towards a source or level of methionine included in the semi-synthetic diet were observed. The short-term feeding of a methionine deficient diet displayed lower plasma methionine and higher plasma homocysteine concentrations compared to cats fed a methionine sufficient diet. A feeding and isotope protocol was developed for indicator amino acid oxidation studies in cats to ensure achievement of state-state of $^{13}CO_2$ enrichment in breath. A higher dose of ^{13}C-bicarbonate was necessary in cats compared to humans to prime the bicarbonate pool. The minimum methionine requirement estimates in adult cats using the indicator amino acid oxidation technique were higher than the current regulatory recommendations. Future studies should investigate the long-term metabolic effects of different dietary levels of methionine in cats and continue to apply the indicator amino acid oxidation technique to determine the requirement of other indispensable amino acids in this species.