UNIVERSITY of GUELPH

ONTARIO AGRICULTURAL COLLEGE

DEPARTMENT OF ANIMAL BIOSCIENCES

PhD Defence

Changing the Energy Game: Net Energy in Protein and Fibre Diets for Cats

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Date: **Thursday April 30, 2026 at 9:00am**

The PhD Defence for Sanjana Anan has been scheduled for Thursday April 30, 2026 at 9:00am. The defence will be held **online via Teams and in room ANNU 141**: https://teams.microsoft.com/meet/28264560674492?p=4pBBPFk7CDmRfdUSjm

Examining Chair: Dr. John Cant

Advisor: Dr. Anna Kate Shoveller

Advisory Committee Member: Dr. Etienne Labussiere

Additional Committee Member: Dr. Andronie Verbrugghe

External Examiner: Dr. Dennis Jewell

Abstract:

Obesity continues to be a prevalent issue for cats globally and one of the major risk factors for the development of this condition is overconsumption of dietary calories. The pet food industry continues to utilize metabolizable energy (ME) based predictive equations, which have been found to inaccurately estimate energy density of diets. To provide true estimates of dietary energy, the heat increment of feeding (HIF) must be quantified to calculate net energy (NE) in diets varying in macronutrient content. The first objective of this thesis was to quantify *in vivo* NE in diets titrating in crude protein (CP) or total dietary fibre (TDF) in exchange with nitrogen-free extract (NFE) by using indirect calorimetry where excreta was collected to measure fecal and urinary energy losses as well. The second goal of the thesis was to assess how HIF was affected by physiological and nutritional factors which can alter NE availability by using a meta-analysis approach. Increasing CP in diets increased apparent digestibility and urinary energy loss but did not affect HIF, which led to higher NE. These results contrast previous NE estimates observed in omnivorous animals, suggesting that cats retained similar efficiency of adenosine triphosphate (ATP) production with higher CP provision. In comparison, increasing TDF reduced digestibility and subsequent NE as expected, but interestingly fecal metabolites indicating gut health function were optimized at intermediate TDF treatment. The meta-analysis found that younger cats fed higher calories had greater HIF whereas high dietary CP and low NFE were associated with greater thermogenesis. Altogether these results suggest that feline HIF production depends on caloric provision by dietary nutrients, which aligned with *in vivo* NE observations where increasing CP improved caloric provision while TDF limited it. Overall, these results should inform formulating less energy dense diets suited for metabolic adaptations of the carnivore cat.