Session 4.2: Climate Change Mitigation Strategies.

S04.O-10

INTEGRATING GENETICS AND NUTRITION STRATEGIES TO DEVELOP A ROADMAP FOR GREENHOUSE GAS MANAGEMENT IN RUMINANT SPECIES

Christine Baes[1], Rachel Gervais[2], Paul Stothard[3], Flavio Schenkel[1], Ermias Kebreab[4], Jennifer Ellis[1], Debora Santschi[5], Michael Von Massow[1], Caeli Richardson[6], Graham Plastow[3], Leluo Guan[3], Katherine Wood[1], Francesca Malchiodi[7], Angela Canovas[1], Tom Wright[8], Kent Weigel[9], Francisco Peñagaricano[9], Oscar Gonzales-Recio[10], Jan Lassen[11], Donagh Berry[12], Raffaella Finocchiaro[13], Adrien Butty[14], Steven Miller[15], Sam Clark[15], Reinhardt Reents[16], Douglas Macdonald[17], Filippo Miglior[1].

[1]University of Guelph, Guelph, Canada; [2]Université Laval, Montreal, Canada; [3]University of Alberta, Edmonton, Canada; [4]University of California Davis, Davis, United States; [5]Lactanet, Montreal, Canada; [6]Abacus Bio, Edinburgh, United Kingdom; [7]Semex, Guelph, Canada; [8]OMAFRA, Guelph, Canada; [9]University of Wisconsin, Madison, United States; [10]INIA, Madrid, Spain; [11]Aarhus University, Tjele, Denmark; [12]Teagasc, Moorepark, Republic of Ireland; [13]ANAFIBJ, Cremona, Italy; [14]Qualitas AG, Zug, Switzerland; [15]University of New England, Armidale, Australia; [16]VIT, Verden, Germany; [17]Environment and Climate Change Canada, Ottawa, Canada.

The agriculture sector has been recognized as a contributor to global greenhouse gas (GHG) emissions, with ruminant species such as dairy and beef cattle being among the most significant sources of methane emissions. To address this challenge, a multi-disciplinary team of researchers from several different organization have undertaken a project to develop a roadmap for GHG management in ruminants through integrating cutting-edge knowledge and datasets from the fields of genetics and nutrition.
The main objective of this project is to provide the industry with a mitigation toolbox, a pipeline to make emission calculations easier, more accessible, and adaptable to each farm so that producers can monitor and manage their emissions. The roadmap will also provide policy makers and inventory specialists with a robust and accurate cow/herd level estimate of GHG production for dairy animals. Our approach will leverage resources developed through previous and current large-scale projects to produce accurate farm-, regional-, system-, and industry-level estimates of emissions and to identify system efficiencies and opportunities for mitigation of enteric GHG emissions in ruminants.
Specific technical objectives include development of scientific protocols that quantify impact and uncertainty surrounding GHG mitigation strategies, estimation of individual animal and herd-level emissions, quantification of the benefits of reducing GHG emissions, consolidation of existing methane emissions data (including beef), enhancement of genomic evaluations for methane emissions through MIR-predicted CH4, identification of structural genomic variants associated with phenotypic variation in GHG emissions, and quantification of the value of reductions in methane emissions.
Our roadmap will allow a 55% reduction (30-40% from nutrition and 30% from genomic strategies) in GHG emissions from Canadian dairy with additional potential reduction in beef; further net savings is expected through correlated genetic gain in production efficiency.
In addition, a balanced genomic evaluation strategy including GHG emission traits with consideration of the numerous traits currently included in the national evaluation (e.g. metabolic disease, fertility, production, conformation, functional traits, etc.) will be developed. Key data will be integrated into new genomic tools for dairy and beef cattle. We will measure reductions in emissions, public attitudes to emissions reductions, and stakeholder engagement. Further activity will provide insights into the value and potential for emissions reductions to help prioritize areas of focus for the GHG mitigation roadmap and embedded toolbox.
The results of this project will provide accurate, reliable, and robust data for farmers, stakeholders,

industry members, and national policy and GHG inventories. The project will also help identify the value chain barriers and opportunities to target adoption of strategies on-farm. Results of individual cow and herd-level emissions will be made available to policy developers and governmental officials responsible for greenhouse gas inventories in Canada.

The ultimate goal of this project is delivery of a roadmap, consisting of multiple tools, for bovine GHG management which will be used to inform producers, industry stakeholders, and national policy-makers. This systems-level approach will provide a model for other countries facing similar challenges in managing GHG emissions from ruminant species.