Highlights

in Canadian Dairy Cattle Research

March
2006

Dairy Farmers of Canada
Les Producteurs laitiers du Canada

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

Catalogue No. A52-75/2006E
ISBN 0-662-43729-2

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Introduction

Canada has more than 15 research centres, with some 150 researchers doing scientific work connected with dairy production. This research yields a large amount of information essential to the growth and profitability of Canada's dairy industry.

This information is disseminated in scientific journals that are often little known to and little used by dairy producers. The Dairy Farmers of Canada (DFC) and the Canadian Dairy Network (CDN) together asked, on behalf of Canadian dairy producers, that a document be developed to inventory the results of the research funded by all Canadian dairy industry partners. The purpose of this document would be to make the results published in the scientific journals accessible to as wide an audience as possible within the dairy industry.

First, we identified the scientific articles published by Canadian researchers working in this field. The period covered was 15 months, from July 2004 to September 2005. Then we wrote a short abstract in non-technical language for each of the articles, which we grouped into various categories: animal welfare, environment, feeding, genetics, health, herd management and reproduction. Once the abstracts had been written, we contacted the authors to obtain their approval of the information. The necessary modifications were made and a few researchers proposed their own abstracts (the name of the researcher who proposed the abstract is indicated).

This document is meant to showcase the results of research published by our Canadian researchers and to encourage Canadian industry stakeholders to consult the various scientific journals. With a view to proper interpretation of the results, each article includes a complete reference. Thus, you will be able to use the additional information to access the scientific articles for a better understanding of the research results. Copyright in the scientific articles cited in the document remains the property of the various scientific journals.

The document has been revised by Réjean Bouchard, PhD, of the DFC; Brian Van Doormaal, of the CDN, and Jacques Surprenant, PhD, of Agriculture and Agri-Food Canada (AAFC).

Acknowledgements:

This document was made possible by funding from the DFC, the CDN and AAFC. It required close collaboration and exceptional teamwork. I want to thank Réjean Bouchard, Brian Van Doormaal and Jacques Surprenant for their support. I also want to thank all the researchers who generously participated in revision of this document, Annie Falardeau, who inventoried the scientific articles and Richard Lefebvre, who, with the help of Geneviève Bergeron and Édith Doyle, wrote the abstracts. Special thanks go to the *CIBLE SOLUTIONS D'AFFAIRES* team, especially Nancy Boivin and Karyne Demers, under the supervision of Bianca Jacques, for the technical production and visual presentation of the document. Finally, all my thanks to Helen Lavigne for her technical support throughout this project and to Translation and Text Revision Services of AAFC for its excellent work.

For further information on the research presented in this document, please contact Pauline Bilodeau, Technology Transfer Officer, AAFC, by telephone, at (819) 565-9174, ext. 106, by fax, at (819) 564-5507, by e-mail, at bilodeaupa@agr.gc.ca or by mail, at the Dairy and Swine Research and Development Centre, Agriculture and Agri-Food Canada, 2000 College Street, PO Box 90 Stn Lennoxville, Sherbrooke QC J1M 1Z3.

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Dairy cattle research is currently being carried out in four different locations:

1. Dairy and Swine Research and Development Centre (DSRDC), Lennoxville (QC), Guelph (ON)
2. Pacific Agri-Food Research Centre (PAFRC), Agassiz (BC)
3. Lethbridge Research Centre (LRC), Lethbridge (AB)

Researchers

- Dr. Karen Beauchemin, Ruminant Nutrition (Lethbridge)
- Dr. Chaouki Benchaar, Metabolism and Nutrition of Ruminants (Lennoxville)
- Dr. Robert Berthiaume, Forage Utilization by Dairy Cows and Growing Cattle (Lennoxville)
- Dr. Nathalie Bissonnette, Biology of Lactation of Ruminants (Lennoxville)
- Dr. Johanne Chiquette, Rumen Microbiology of Dairy Cattle (Lennoxville)
- Dr. Louis Delbecchi, Biology of Lactation of Ruminants (Lennoxville), Member, Canadian Bovine Mastitis Research Network (CBMRN)
- Dr. Anne Marie de Passillé, Animal Welfare and Comfort (Agassiz)
- Dr. Moussa Diarra, Microbiology, Immunology, Genetics (Agassiz), Member, CBMRN
- Dr. Christiane L. Girard, Ruminant Nutrition (Lennoxville)
- Dr. Michael Ivan, Ruminant Nutritional Physiology (Lennoxville)
- Dr. John Kastelic, Bovine Reproduction (Lethbridge)
- Dr. Karen Koenig, Ruminant Nutrition (Lethbridge)
- Dr. Pierre Lacasse, Biology of Lactation of Ruminants (Lennoxville), Member, CBMRN
- Dr. Carole Lafrenière, Forage Crop Management and Silage Microbiology (Lennoxville/Kapuskasing experimental farm)
- Dr. Hélène Lapierre, Ruminant Nutrition and Metabolism (Lennoxville)
- Dr. Martin Lessard, Immunology and Nutrition (Lennoxville)
- Dr. Ching Y. Lin, Animal Genetics (Guelph)
- Dr. Daniel Massé, Environmental Biotechnology and Farm Effluents Management (Lennoxville)
- Dr. Tim McAllister, Ruminant Nutrition, Microbiology and Metabolism (Lethbridge)
- Dr. Sean M. McGinn, Environmental Health (Lethbridge)
- Dr. Filippo Miglior, Animal Genetics (Guelph)
- Dr. Prya Mir, Ruminant Nutrition and Metabolism (Lethbridge)
- Dr. Daniel Ouellet, Ruminant Nutrition and Metabolism (Lennoxville)
- Dr. Hélène Petit, Ruminant Nutrition and Metabolism (Lennoxville)
- Dr. Jeff Rushen, Animal Welfare and Comfort (Agassiz)
- Dr. Asherber Sewalem, Animal Breeding and Genetics (Guelph)
- Dr. Jong-Su Eun, Ruminant Nutrition (Lethbridge)
- Dr. Doug Veira, Nutritional and Physiological Factors Affecting Cattle Health and Welfare (Agassiz)
- Dr. Wen Z Yang, Ruminant Nutrition (Lethbridge)

Fields of research

1. Micro organisms and their substrates: optimizing the ruminal function
2. Improving feed efficiency to reduce greenhouse gas (GHG) emissions
3. Metabolic pathways involved in nitrogen digestion/increasing the transfer of feed proteins into milk proteins/improving protein efficiency and decreasing nitrogen excretion
4. Optimizing the use of forage in dairy cattle systems
5. Reviewing the dairy cow's need for complex B vitamins to optimize health and productivity
6. Studying the effect of dietary fats in the rations on milk production and dairy cow reproduction
7. Studying the nutritional impact on milk composition
8. Enhancement of lactation persistency in dairy cows
9. New approaches to control bovine mastitis
10. Using molecular biology to better understand bovine metabolism and to identify genes involved in important biological pathways
11. Genetic improvement of livestock
12. Reproduction
13. Animal welfare and comfort

GREENHOUSE GAS MITIGATION PROGRAM

INTRODUCTION

The Greenhouse Gas Mitigation Program for Canadian Agriculture (GHGMP) was announced in 2002, as part of the Action Plan 2000 on Climate Change. Various industry groups, in partnership with Agriculture and Agri-Food Canada (AAFC), have delivered this five-year program to create awareness among producers about management practices that reduce these emissions while bringing them economic benefits and to demonstrate these practices.

DEMONSTRATION PROJECTS

The dairy component of the GHGMP, delivered by the Dairy Farmers of Canada (DFC) and called "Our Cows, Our Air," have carried out demonstration projects in various regions across Canada.

ATLANTIC PROJECT

This project consisted of two initiatives: one carried out by the Nova Scotia Agricultural College at the Kipawo Holsteins farm in Grand Pre, Nova Scotia; and the other by the Atlantic Dairy and Forage Institute (ADFI) in Keswick Ridge, New Brunswick. The project was divided into two components. One involved comparing the methane emissions from dairy cows fed pasture– or silage-based diets. The second component involved testing two feed supplements—roasted soybean and confectionery waste—to determine their potential to reduce methane emissions and improve cow performance.

First component

The methane emission levels were found to be comparable for cows fed pasture and those fed silage. However, from the standpoint of total farm greenhouse emissions (emissions from fuel use, electricity, fertilizer, etc.), the researchers determined that pasture feeding generated lower total emissions than silage diets.

Second component

Although earlier research showed that adding fat to cow rations could reduce methane emissions, the findings of the present study concerning the effects of roasted soybean supplements are inconclusive, because the cows did not eat the full amount supplied. The dietary addition of sugar (confectionery waste) did not have a marked effect on methane emissions; however, the researchers found that the cows given sugar supplements produced more milk. This shows that a little bit of sugar can be beneficial.

QUEBEC PROJECT

This project, which was carried out under the supervision of AAFC in Lennoxville, Quebec, compared greenhouse gas (GHG) emissions from cows and from manure on dairy farms with different levels of milk production and different management practices. The project consisted of two components. The first component involved identifying practices that limit GHG emissions, while maintaining herd productivity. The second component involved demonstrating the potential that biofiltration has for reducing methane emissions from cow barns and manure pits on commercial dairy farms.

First component

On two different farms, gas-measuring equipment was installed to permit continuous sampling and analysis of the air entering and exiting mechanically ventilated cow barns. This was done to determine the amount of methane produced indoors by the animals. The two farms differed in terms of cow breed, diets and supplements used, number of meals per day and manure management practices. At both farms, peak emissions were found to be correlated with the animals' feeding schedule.

A single cow produces between 350 L and 650 L of methane per day. There are several ways to treat these emissions and to reduce the methane level in the exhaust air from cow barns. Cost and environmental effects are important considerations in choosing a technique for this purpose.

Second component

Biofiltration appears to be a promising approach; this natural process uses bacterial oxidation for the aerobic degradation of contaminants in air streams. The contaminants are absorbed and then oxidized by the microorganisms in the biofilter medium (e.g., peat, compost, wood chips). The microbes "eat" the particles of methane, converting them into the less harmful gas carbon dioxide and water.

A large-scale experimental biofilter was developed and built. It has four compartments, each with a different filtering medium. The biofilter was mounted on a trailer so it could be moved from farm to farm to evaluate its effectiveness in oxidizing methane from different sources. Based on preliminary results, a methane reduction efficiency of 80% is attained for concentrations of 0.5% to 2.5%.

ONTARIO PROJECT

This project was undertaken by University of Guelph researchers at the Elora Dairy Research Farm and at Mayhaven Farms in Rockwood, Ontario. Two feeding strategies using corn and the dietary addition of myristic acid, an extract from palm oil, were evaluated for their potential to reduce methane emissions from dairy cows.

The results showed that dry-rolled corn reduced methane emissions by 7% per day, per kilogram of milk produced, compared with steam-flaked corn. Myristic acid had an even greater effect, reducing methane emissions by 28% per day, per kilogram of milk produced.

Incorporating dry-rolled corn into rations involves making only a slight change in cow diets; hence, it is a more practical strategy and one that producers will find easier to implement. Adding dry-rolled corn to diets can benefit the environment as well as cow performance.

WESTERN CANADA PROJECT

A team from AAFC's Lethbridge Research Centre (LRC), in Alberta, conducted feeding trials to determine the amount of methane produced by commercial dairy farms and then looked at ways of modifying cow diets in order to reduce emissions.

Amount of methane generated by commercial dairy farms

Methane emissions, which were measured in air downstream from dairy barns using laser technology, ranged from 438 L to 519 L per animal per day. All cows older than three months were included in the analysis. It was predicted that, because of their higher feed intake, lactating cows would generate about 600 L of methane per day, which, over the long run, adds up to a large amount.

Feeding strategies to reduce emissions

Several feeding strategies aimed at reducing methane emissions were evaluated. A 3%–4% increase in the amount of plant-derived fat supplied in cow rations could reduce the amount of feed energy lost as methane by 20%. Edible oils or oilseeds such as sunflower seeds, rapeseed, ground canola or flaxseed, can be used as fat supplements.

McGill

Faculty and Adjunct Professors

- Dr. Roger I. Cue, Associate Professor in Animal Breeding
- Dr. Humberto Monardes, Associate Professor of Animal Breeding
- Dr. Arif F. Mustafa, Assistant Professor of Dairy Nutrition
- Dr. Kevin M. Wade, Associate Professor in Information Systems
- Dr. David Zadworny, Associate Professor of Molecular Biology
- Dr. Xin Zhao, Professor of Animal Physiology, Member, Canadian Bovine Mastitis Research Network

Fields of research

1. Heifers management
2. Interactive visualization techniques
3. Machine-learning-based interpretation of lactation curves
4. Milk planning
5. Mammary gland health
6. Using molecular biology to better understand bovine metabolism and to identify genes involved in important biological pathways
7. Genetic improvement of livestock

Nova Scotia Agricultural College

Faculty and Adjunct Professors

- Dr. Alan Fredeen, Dairy systems, Ruminant Nutrition
- Dr. Leslie MacLaren, Dairy Reproduction

Fields of research

1. Evaluation of marine algae as a feed source in dairy cattle
2. Reducing greenhouse gas (GHG) emissions
3. Supplementation and transition cows strategies
4. Prediction of the effect of grazing on environmental and economic sustainability of dairy systems in Atlantic Canada
5. Lifecycle assessment of pasture-based and confinement dairy systems
6. Biodiversity in pasture agro-ecosystems: Pasture management strategies to enhance biodiversity and habitat
7. Dairy Reproduction/Cell biology of pregnancy establishment

Réseau canadien de recherche sur la mammite bovine
Canadian Bovine Mastitis Research Network

Overview of the Canadian Bovine Mastitis Research Network

Mastitis affects every dairy farm worldwide and costs the Canadian dairy industry as much as $300-$400 million each year. Canadian researchers have joined forces with Canadian dairy farmers to minimize the impact of this complex disease on the production of high-quality milk and to reduce usage of antibiotics on farm. CBMRN is a partnership of nine Canadian research institutions (Université de Montréal, Université Laval, University of Prince Edward Island, University of Guelph, University of Saskatchewan, Université de Sherbrooke, McGill University, Agriculture and Agri-Food Canada (AAFC and Public Health Agency of Canada) with Canadian dairy industry organizations. Partners include dairy farmers of Quebec, Alberta, Prince Edward Island, New Brunswick, Nova Scotia, Ontario and Canada, The Canadian Dairy Network (CDN), Pfizer Animal Health and *Valorisation-Recherche Québec.* The dairy industry contributes management and planning leadership and collaboration. The mission of the CBMRN is to mobilize national and international scientific and financial resources to decrease the incidence of mastitis, reduce financial losses, and maintain milk quality through concerted research, and effective and rapid transfer of results to end-users. The CBMRN administrative team of 4 people is located at the *Faculté de médecine vétérinaire, Université de Montréal*, in Saint-Hyacinthe, QC.

The CBMRN's multidisciplinary research program coordinates the expertise and resources of Canada's established scientists working on bovine mastitis with scientists possessing complementary skills in a unique nation-wide research effort. The CBMRN also collaborates closely with other professionals serving the industry from across Canada, and with animal health biotechnology industry, to carry its research and to transfer the resultant knowledge and technology back into farmers' hands. Moreover, the CBMRN provides integrated training to Canada's future scientists, including both graduate students and post-doctoral fellows. Trans-disciplinary research collaboration and linkages between laboratories provide students with unique opportunities for multidisciplinary training and networking.

The Research Program

The research program consists of a Core Research Platform (CRP) to which are linked the Mastitis Monitoring and Mastitis Control Research Themes. The CRP is unique in bovine mastitis research and it consolidates multiple data collection and archival needs and geographically extensive dairy farm participants into one uniform plan.

It comprises

1) a national cohort of cooperating dairy farms to serve as a basic source of material and data,
2) a network of laboratories for milk bacteriologic analysis,and
3) a mastitis pathogen culture collection linked to an epidemiology database and to a host DNA archive.

In the context of the CRP, the diagnostic laboratories at the country's four veterinary faculties will analyze milk samples from the cohort with coordinated protocols for milk bacteriology, quality control and reporting of results. All isolated mammary pathogens will be characterized and archived in the mastitis pathogen culture collection and host DNA will be archived for current and future host genetics research.

The Mastitis Monitoring and Mastitis Control Research Themes integrate applied and fundamental research techniques together. The Monitoring Theme aims to develop and transfer monitoring knowledge and technologies by benchmarking pathogen-specific mastitis incidence, devising efficient monitoring strategies, identifying virulence factors and testing rapid diagnosis methods. The Control Theme aims to develop and transfer knowledge and technologies with research on host-pathogen interaction, therapy strategies and antibiotic resistance.

The Atlantic Dairy and Forage Institute

Contacts

- Wiebe Dykstra, Executive Director; dykstra@nbnet.nb.ca
- Marian Gilbert, Administrator; margilin@nbnet.nb.ca

The Atlantic Dairy and Forage Institute (ADFI) is a private research facility located on a 150-acre working dairy farm in Fredericton Junction, New Brunswick. It was created in 1996 on behalf of the dairy producers of Atlantic Canada and is managed by a board of six regionally elected directors. Their goal is to provide a venue for on-farm research in dairy production for both producers and industry manufacturers. The institute has a tie stall operation with 55 lactating cows. ADFI can conduct on-farm research trials related to dairy and forage production. Their experiments include the evaluation of feedstuffs on milk production, nutrient utilization and cow reproduction and soil, crop and manure management.

ADFI Research projects

1. Study: Evaluation of Ingredients for Ruminants – tested in Cannulated Dairy Cows
2. Study: Effect of Amino Acid (AA) Supplementation on Nutrient Digestion and Microbial Protein Synthesis in the Rumen of Dairy Cows
3. Study: 5 Samples of Dung (Yak, Camel, Horse, Sheep)
4. Study: Evaluation of Factors Affecting Milk Components on New Brunswick Dairy Farms
5. Study: Livestock Environmental Initiative - Improvement in N Utilization by Feeding Flaxseed to Dairy Cows
6. Study: Testing a Product that can be used to Enhance Rumen Digestion
7. Study: In Vivo Evaluation of Coatings to Protect Nutrients from Rumen Degradation
8. Study: LYS Derivatives Degradation in Lactating Dairy Cows
9. Study: Greenhouse Gas Mitigation in the Dairy Industry – demonstrate the GHG effectiveness of pasture grazing, conventional “slug feeding” and total mixed ration (TMR) feeding, validate the GHG emission reductions associated with changes in dairy feed rations

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UNIVERSITY OF ALBERTA

Dairy Research & Technology Centre

Faculty and Adjunct Professors

- Dr. John Kennelly, Dean, Faculty of Agriculture, Forestry, and Home Economics
- Dr. Burim Ametaj, Assistant Professor, Ruminant Nutritional Immunology
- Dr. Lorraine Doepel, Assistant Professor, Dairy Cattle Nutrition and Metabolism, Director, Dairy Research Technology Centre (DRTC), Dairy Cattle Nutrition and Lactation Physiology
- Dr. David Glimm, Research Associate, Dairy Cattle Genomics
- Dr. Reza Khorasani, Manager, Dairy Research and Technology Centre
- Dr. Masahito Oba, Assistant Professor, Dairy Nutrition and Physiology
- Dr. Divakar Ambrose, Dairy Research Scientist (Adjunct Professor), Reproductive Physiology and Management, Alberta Agriculture, Food and Rural Development
- Dr. Steven Moore, CABIDF Chair in Beef Genomics

The Dairy Research Technology Centre

The DRTC is a partnership between the University of Alberta, the Department of Agricultural, Food and Nutritional Science and Alberta Agriculture, Food and Rural Development, Alberta Milk Western Dairy Science Inc. This union brings together the resources of all partners with the vision to be Canada’s leading centre for excellence in dairy research, teaching and technology transfer to stake holders in the dairy industry.

- Rick Corbett: Dairy Nutritionist, Technology Transfer Specialist

Fields of research

1. Increasing the longevity of dairy cows
2. Improving cow nutrient utilization and efficiency
3. Modifying milk composition and development of new dairy products
4. Improving health and wellness benefits of milk and milk products
5. Improving reproductive efficiency
6. Improving health status in transition cows
7. Decrease stress susceptibility in dairy cows
8. Beef Genomics program

THE UNIVERSITY OF BRITISH COLUMBIA

Faculty and Adjunct Professors

- Dr. David Fraser, Professor of Animal Welfare
- Dr. Jim Love, Director, Animal Care
- Dr. D. Rajadurai Rajamahendran, Professor, Agroecology
- Dr. Marina (Nina) von Keyserlingk, Assistant Professor
- Dr. Dan Weary, Professor, Natural Sciences and Engineering Research Council (NSERC), Industrial Research Chair in Animal Welfare

Fields of research

1. Early detection of lameness in dairy cows
2. Improving cow comfort
3. Using feeding behaviour of dairy cows to improve feeding management
4. Using feeding behaviour as an early indicator of disease
5. Improving methods of feeding milk to dairy calves
6. Reducing pain associated with dehorning dairy calves
7. Dairy cattle reproduction

UNIVERSITY of GUELPH

Research Mission Statement

Undertake innovative research to support competitive and sustainable dairy production, while improving the Ontario environment and ensuring quality and safety of Ontario dairy product.

Dairy Research Scientists

- Dr. Dean Betts, Department of Biomedical Sciences
- Dr. Mary Buhr, Department of Animal and Poultry Science
- Dr. John Cant, Department of Animal and Poultry Science
- Dr. Randy Dingwell, Department of Population Medicine, Member, Canadian Bovine Mastitis Research Network (CBMRN)
- Dr. Todd Duffield, Department of Population Medicine
- Dr. Patricia Gentry, Department of Biomedical Sciences
- Dr. Spencer Henson, Department of Agricultural Economics and Business
- Dr. Robert Jacobs, Department of Pathobiology
- Dr. Niel Karrow, Department of Animal and Poultry Science, Member, CBMRN
- Dr. David Kelton, Department of Population Medicine, Member, CBMRN
- Dr. Stephen LeBlanc, Department of Population Medicine
- Dr. Ken Leslie, Department of Population Medicine, Dairy Research Coordinator, Member, CBMRN
- Dr. Kerry Lissemore, Department of Population Medicine
- Dr. Bonnie Mallard, Department of Pathobiology, Member, CBMRN
- Dr. Brian McBride, Department of Animal and Poultry Science
- Dr. Suzanne Millman, Department of Population Medicine
- Dr. Vern Osborne, Department of Animal and Poultry Science
- Dr. Andrew Peregrine, Department of Pathobiology
- Dr. Andy Robinson, Department of Animal and Poultry Science
- Dr. Larry Schaeffer, Department of Animal and Poultry Science
- Dr. Jim Squires, Department of Animal and Poultry Science
- Dr. Henri Stampfli, Department of Clinical Studies
- Dr. Don Trout, Department of Clinical Studies
- Dr. John Walton, Department of Animal and Poultry Science
- Dr. Scott Weese, Department of Clinical Studies
- Dr. Darren Wood, Department of Pathobiology
- Dr. Jim Fisher, Kemptville College
- Dr. Dennis McKnight, Kemptville College
- Dr. Jonathan Morgan, Kemptville College
- Dr. Paul Sharpe, Kemptville College

Fields of research

1. Improving dairy cow productivity through nutrition
2. Improving dairy cow productivity through genetics and reproduction research
3. Improving the longevity of dairy cows
4. Understanding the impact of disease on cattle health and productivity
5. Improving dairy animal welfare
6. Reducing the impact of dairying on the environment
7. Improving quality and safety of milk products

UNIVERSITÉ LAVAL

Dairy Research Scientists

- Dr. Yvan Chouinard, Lipid Metabolism, Modifying Milk Composition, Member, Canadian Bovine Mastitis Research Network (CBMRN)
- Dr. Doris Pellerin, Farm and Herd Management, Optimizing Forage Use
- Dr. François Richard, Oocytes and Granulosa Development and Culture
- Dr. Claude Robert, Genetic Improvement of Production Traits, Genomics, Member, CBMRN
- Dr. Marc-André Sirard, Reproductive Biotechnology and Genomics
- Dr. Linda Saucier, Meat Quality and Salubrity

Fields of research

1. Studying the effect of dietary fats in the rations on milk production and composition
2. Producing forage with specific characteristics
3. Producing milk from forages in Quebec, the economic alternative
4. Using genomics and proteomics to understand oocyte and early embryo functions in farm animals

Centre de recherche en biologie de la reproduction

The *Centre de recherche en biologie de la reproduction* (CRBR) [research centre in reproductive biology] is a very active team of researchers interested in human and animal reproduction, advanced technology, the responsible use of such technology and ethical issues related to the field. The complementary skills of the CRBR researchers allow them to work jointly towards improving reproductive performance in domestic mammals and humans. By furthering scientific knowledge and contributing to the advancement of technology, the CRBR aims to facilitate the training of high-level scientists in the field.

Research themes:

Ovarian Function
Embryonic Development
Testicular Function
Foetal-maternal interactions
Transdisciplinarity
Toxicology

UNIVERSITY OF MANITOBA

Faculty and Adjunct Professors

- Dr. Karin Wittenberg, Department Head, Ruminant Nutrition, Forage Utilization
- Dr. Gary Crow, Associate Department Head, Animal Breeding and Genetics
- Dr. Alma Kennedy, Associate Professor, Physiology
- Dr. Kees Plaizier, Assistant Professor, Dairy Cattle Nutrition and Management.
- Dr. Kim Ominski, Assistant Professor
- Dr. Laurie Connor, Reproduction Physiology

Fields of research

1. Study the impact of subacute ruminal acidosis (SARA) on health and production of dairy cows
2. Preventing SARA in barley-based diets
3. Improving nutrient utilization by optimization of feeding time and feeding patterns
4. Development of a dynamic model describing the relationships between chemical and physical diet composition, feeding strategy and rumen conditions

Université de Montréal

Faculty and researchers

- Dr. Marie Archambault, Department of Pathology and Microbiology
- Dr. Pascale Aubry, Department of Clinical Sciences
- Dr. Michel Bigras-Poulin, Department of Pathology and Microbiology
- Dr. Émile Bouchard, Department of Clinical Sciences Member, Canadian Bovine Mastitis Research Network (CBMRN)
- Dr. Paul D. Carrière, Department of Veterinary Biomedicine Member, *Centre de recherche en reproduction animale* (CRRA) [animal reproduction research centre]
- Dr. Jérôme Del Castillo, Department of Veterinary Biomedicine
- Dr. Luc DesCôteaux, Department of Clinical Sciences Member, CBMRN
- Dr. André Desrochers, Department of Clinical Sciences
- Dr. Monique Doré, Department of Pathology and Microbiology Member, CBMRN
- Dr. Pascal Dubreuil, Department of Clinical Sciences
- Dr. S. Mehdy Elahi, Department of Pathology and Microbiology/Diagnostic Service/Laboratory of Virology
- Dr. John M. Fairbrother, Department of Pathology and Microbiology
- Dr. Gilles Fecteau, Department of Clinical Sciences
- Dr. David Francoz, Department of Clinical Sciences
- Dr. Carl A. Gagnon, Department of Pathology and Microbiology
- Dr. Alan K. Goff, Department of Veterinary Biomedicine Member, CRRA
- Dr. Marcelo Gottschalk, Department of Pathology and Microbiology Member, CBMRN
- Dr. Josée Harel, Department of Pathology and Microbiology
- Dr. Denis Harvey, Department of Clinical Sciences
- Dr. Réjean Lefebvre, Department of Clinical Sciences Member, CRRA
- Dr. Jacques Lussier, Department of Veterinary Biomedicine Member, CRRA
- Dr. Serge Messier, Department of Pathology and Microbiology Director, *Laboratoire de bactériologie clinique* [clinical bacteriology laboratory] Laboratory Coordinator, CBMRN
- Dr. Bruce D. Murphy, Department of Veterinary Biomedicine Director, CRRA
- Dr. Christopher Price, Department of Veterinary Biomedicine Member, CRRA
- Dr. Jean-Philippe Roy, Department of Clinical Sciences Member, CBMRN
- Dr. Daniel Scholl, Department of Pathology and Microbiology Director, CBMRN
- Dr. David W. Silversides, Department of Veterinary Biomedicine Member, CRRA
- Dr. Jean Sirois, Dean, Faculty of Veterinary Medecine, Department of Veterinary Biomedicine and Member, CRRA
- Dr. Lawrence C. Smith, Department of Veterinary Biomedicine, Director, *Chaire de recherche en clonage et biotechnologie de l'embryon*, Member, CRRA
- Dr. Grant Tomita, Department of Pathology and Microbiology Scientific Assistant, CBMRN
- Dr. Eric Troncy, Department of Veterinary Biomedicine
- Dr. Denis Vaillancourt, Department of Clinical Sciences
- Dr. Alain Villeneuve, Department of Pathology and Microbiology

Research groups and other fields of research

- CBMRN
- CRRA
- *Chaire de recherche en clonage et biotechnologie de l'embryon*
- *Groupe de recherche et développement en gestion informatisée de la santé (DSA R&D)* [research and development group for computer-managed animal health]
- *Laboratoire de biotechnologie vétérinaire et alimentaire (LBVA)*

Faculty

- Dr. John A. Van Leeuwen, Associate Professor, National Director, Production Limiting Diseases Dairy Research Project, Coordination Group Member overseeing national development program of Johne's Disease (JD), Member, Canadian Bovine Mastitis Research Network (CBMRN)
- Dr. Herman Barkema, Associate Professor, Farm Service and Epidemiology, leader of the monitoring team of the CBMRN, Member, CBMRN
- Dr. Ian Dohoo, Professor, Epidemiology, Member, CBMRN
- Dr. Greg Keefe, Professor, Dairy Health Management, Member, CBMRN
- Dr. Shawn McKenna, Department of Health Management
- Dr. Javier Sanchez, Research Associate in Epidemiology
- Dr. Henrik Stryhn, Associate Professor, Biostatistics, Department of Health Management, Member, CBMRN
- Dr. Jeff Wichtel, Associate Professor and Chairman, Department of Health Management

Fields of research

1. Monitoring and control of parasites in lactating dairy cattle
2. Mammary gland health
3. Infectious diseases of dairy cattle
4. Trace mineral/milk quality: off-flavour milk/reproduction
5. Impact of high milk urea nitrogen on dairy cows reproduction

Department of Animal and Poultry Science

Faculty and Adjunct Professors

- Dr. Bernard Laarveld, Professor, Physiology and Metabolism
- Dr. David A. Christensen, Professor Emeritus, Dairy Cattle Nutrition and Production
- Dr. Timothy Mutsvangwa, Assistant Professor, Ruminant (Dairy Cattle) Nutrition and Metabolism
- Dr. Henry W Soita, Post-Doc Fellow, Dairy Cattle Nutrition
- Dr. Peiqiang Yu, SAF Research Chair, Synchrotron Applications, Feed Research and Development, Ruminant Nutrition, Feed Science and Feed Chemistry

Fields of research

1. Basic ruminant nutrition and metabolism, with emphasis on nutrient utilization by splanchnic tissues (i.e., gastrointestinal tract and liver) and how this affects post-absorptive delivery of nutrients (especially AA) to peripheral tissues (i.e., mammary gland, muscle)
2. Nitrogen (urea) recycling in ruminants, and how this impacts on AA supply to and protein turnover in peripheral tissues. The mechanisms that control nitrogen recycling to the different gastrointestinal compartments will be investigated so as to improve our understanding of this process and, consequently, develop strategies to improve N retention in ruminants
3. Feeding strategies to manipulate milk composition (e.g., fatty acid (FA) composition).
4. Beef and dairy cattle molecular genetics and includes gene mapping and developing gene tests for traits of economic importance
5. Rare breeds of livestock

Western College of Veterinary Medicine

Faculty, Adjunct Professors and Associate Members

- Dr. Norman Rawlings, Department of Veterinary Biomedical Sciences and Associate Dean Research
- Dr. Gregg Adams, Department of Veterinary Biomedical Sciences
- Dr. A.D. Barth, Department of Large Animal Clinical Sciences
- Dr. Terry Carruthers, Department of Veterinary Biomedical Sciences
- Dr. Patricia Dowling, Department of Veterinary Biomedical Sciences
- Dr. Deborah Haines, Department of Veterinary Microbiology
- Dr. John Kastellic, Department of Large Animal Clinical Sciences
- Dr. Raul Mainar-Jaime, Department of Veterinary Microbiology
- Dr. Reuben Mapletoft, Department of Large Animal Clinical Sciences
- Dr. Jonathan Naylor, Department of Large Animal Clinical Sciences
- Dr. Colin Palmer, Department of Large Animal Clinical Sciences
- Dr. Roger Pierson, Department of Obstetrics and Gynecology
- Dr. Jaswant Singh, Department of Veterinary Biomedical Sciences
- Dr. Joseph Stookey, Department of Large Animal Clinical Sciences
- Dr. Cheryl Waldner, Department of Large Animal Clinical Sciences

Fields of research

1. Reproduction in the male and female cattle
2. Infectious diseases and vaccinology
3. Herd health and epidemiology
4. Food safety and public health
5. Toxicology
6. Animal behaviour and welfare

VIDO RESEARCH PROJECTS IMPACTING THE DAIRY INDUSTRY

Researchers

- Dr. Jose Perez-Casal, Project Leader Canadian Bovine Mastitis Research Network
- Dr. Andrew Potter, Associate Director (Research) Chief Science Officer - Head Science Management
- Dr. Van Drunen Littel-Van den Hurk, Program Manager Nucleic Acid Technologies
- Dr. Phil Willson, Program Manager Vaccine Development

Fields of research

1. Vaccine against mastitis
2. DNA vaccines for cattle
3. Needle-free delivery/High-pressure jet injection
4. Pathogenomics and mucosal immunity
5. The bovine respiratory disease
6. The bovine enteric disease

Animal welfare

1 Bacterial populations on teat ends of dairy cows housed in free stalls and bedded with either sand or sawdust

Researchers

Zdanowicz, M.
Shelford, J.A.
Tucker, C.B.
Weary, D.M.
von Keyserlingk, M.A.G.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2004. Vol. 87, No. 6, p. 1694-1701.

The purpose of this experiment was to compare bacterial populations related to mastitis on teats of lactating dairy cattle housed on sand and sawdust and to assess the relationship between bacterial counts on teat ends and those present in the two bedding types. Cows were housed in free stalls bedded with either sand or sawdust and bedding samples were collected. Samples from teat ends were also collected. Both of these samples were analyzed for coliform, *Klebsiella* spp. and *Streptococcus* spp. populations. Teat ends samples contained twice more coliforms and six times more *Klebsiella* for cows bedded on sawdust than for the ones bedded on sand. However, teat ends samples of cows bedded on sand showed ten times more *Streptococcus* spp. bacteria. There was a general tendency among treatments for an increase in bacterial counts over each experimental week. Bacterial counts in sawdust and in sand were related to bacterial counts on teat ends. It was concluded that there were more coliforms and *Klebsiella* spp. on teat ends of cows bedded on sawdust but more *Streptococcus* on teat ends of cows bedded on sand.

2 Bedding on geotextile mattresses: How much is needed to improve cow comfort?

Researchers

Tucker, C.B.
Weary, D.M.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2004. Vol. 88, No. 9, p. 2889-2895.

This study aims to assess how the amount of sawdust bedding on mattresses affects dairy cattle behaviour and preferences. Eleven non-lactating cows were housed individually in pens and given access to three free stalls with geotextile mattresses varying in the amount of kiln-dried sawdust they were covered with. The experiment was divided into two phases: a restriction phase, where cows were given access to only one of the three stalls at a time and a free-choice phase, where cows were given access to all three stalls. A more important amount of bedding increased the time spent lying down and the number of lying bouts of the cows. It was also observed that when there was more sawdust in the stalls, cows spent less time standing with only the front hooves in it. During the free-choice phase, there was an overall preference for the stall with the larger amount of sawdust and cows spent more time lying and standing in this stall. It was concluded that cow comfort is improved by an important amount of sawdust in stalls with geotextile mattresses.

3 Claw hardness of dairy cows: Relationship to water content and claw lesions

Researchers

Borderas, T.F.
Pawluczuk, B.
de Passillé, A.M.
Rushen, J.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

PAFRC, Agassiz (BC)

Journal of Dairy Science. 2004. Vol. 87, No. 7, p. 2085-2093.

Lameness is a major welfare and economic problem in dairy herds. Chances of injury or of claw lesions are influenced by the degree of hardness of claws, which can become soft when exposed to moisture. This study aimed to assess the relationship between hardness of the claw horn, quantity and rate of absorption of water and incidence of claw lesions. Four experiments were performed to achieve this goal. The first three consisted in soaking pieces of the claw horn in water for a period of 12 hours to 24 hours. The water was absorbed as soaked claws weighed more and were softer after the treatment. One-third of the water was absorbed within the first hour. It was also found that the sole was the softer part. Yet, the base of the axial and the dorsal walls of the claw softened more rapidly than the sole. Significant negative correlations were found between claw hardness and the severity of claw lesions in the fourth experiment, meaning that softer claws produced the most severe claw lesions. It was concluded that succinct exposure to moist surfaces results in softer claws and those cows with softer claws are at greater risk for lameness.

4 Competition for teats and feeding behaviour by group-housed dairy calves

Researchers

von Keyserlingk, M.A.G.
Brusius, L.
Weary, D.M.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2004. Vol. 87, No. 12, p. 4191-4194.

The object of this study was to determine how calf competitive behaviour and meal-based feeding patterns, and milk intake are affected by a restricted access to teats. Fifteen female calves were fed a teat-to-calf ratio varying on a daily basis from 1:3 to 4:3. The number of meals was not affected by a decrease in the number of teats but the total time on the teat and milk consumption decreased as the number of teats changed from 4 to 1. Competitive interactions were affected by teat access, it happened more frequently with a reduction in teat access. The number of displacements from one teat to another increased as the number of teats decreased from four to one. It was concluded that in group-housed calves, competitive interactions were increased and feeding time and milk intake decreased as a result of a reduced access to teats.

5 Designing better water troughs: Dairy cows prefer and drink more from larger troughs

Researchers

Machado Filho, L.C. Pinheiro
Teixeira, D.L.
Weary, D.M.
von Keyserlingk, M.A.G.
Hotzel, M.J.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Applied Animal Behaviour Science. 2004. Vol. 89, No. 3-4, p. 185-193.

The aim of this study was to evaluate the effects of water trough height and size on the preference and water intake of cows in pasture. To achieve this goal, two experiments were performed. The first one involved 14 cows that were given access to two water troughs that varied in height and size. A preference was observed for the higher and larger trough, from which cows drank more water, spent more time drinking and took more sips. In the second experiment, the two troughs were at the same height. It was found that cows spent more time drinking and drank a larger quantity of water from the larger trough. Water consumption was also measured to see if it was affected when cows did not have any choice between troughs. All cows drank more water when they had access to the larger and higher trough.

6 Effect of feeding space on the inter-cow distance, aggression and feeding behaviour of free-stall housed lactating dairy cows

Researchers

DeVries, T.J.
von Keyserlingk, M.A.G.
Weary, D.M.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2004. Vol. 87, No. 5, p. 1432-1438.

The aim of this study was to evaluate whether doubling the feed bunk space from 0.5 to 1 m per cow results in increased spacing between cows at the feeder, fewer aggressive interactions, and increased feeding activity. Feed bunk space of 0.5 and 1 m per cow were provided and the inter-cow distance, incidence of aggressive displacements and time spent feeding were recorded. The results indicated that when cows were given more feed space, they were less aggressive and there was more space between the cows. These effects resulted in increased feeding activity during the day and, moreover, during the 90 minutes after the delivery of fresh feed. This effect was strongest for the subordinate cows. It was concluded that increasing the available space at the feed bunk will increase feeding activity and decrease competition between cows.

7 Effect of rubber flooring in front of the feed bunk on the time budgets of dairy cattle

Researchers

Fregonesi, J.A.
Tucker, C.B.
Weary, D.M.
Flower, F.C.
Vittie, T.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2004. Vol. 87, No. 5, p. 1203-1207.

In this research, the effect of rubber flooring in front of the feed bunk was evaluated in relation to the immediate behavioural response of dairy cattle. Cows were alternatively housed in sections of the free stall barn with 1.85 m of rubber flooring or grooved concrete area in front of the feed bunk. Time spent standing increased slightly, not only in the area in front of the feed bunk but also elsewhere in the pen, in stalls with rubber. Rubber flooring did not affect time spent eating. However, time spent lying down in the free stall with rubber in front of the feed bunk was smaller. It was concluded that cows housed in free stalls with rubber in front of the feed bunk showed small differences in the time they spent standing and where they stood in the pen. However, the biological implications of these changes remain unclear.

8 Improving stall design: Use of 3-D kinematics to measure space use by dairy cows when lying down

Researchers

Ceballos, A.
Sanderson, D.
Rushen, J.
Weary, D.M.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2004. Vol. 87, No. 7, p. 2042-2050.

Recommendations for the dimensions of cow stalls are available but there is not much research supporting these recommendations. Stall dimensions are quite important since uncomfortable stalls reduce the time cows spend resting and increase the risk of lameness. This study aimed to provide the first accurate measures of space used by Holstein dairy cows during lying-down movements in an open space and in a free stall. To perform this study, kinematic techniques were used. It was found that cows used up to 300 cm of longitudinal space when they are lying down, which is more than recommended for stall length, and up to 109 cm of lateral space, which is within width recommendations. Lateral displacements at the hip when cows were lying down occurred in two vertical zones; between 95 and 135 cm and less than 50 cm above the lying surface, while maximal longitudinal displacements of the nose are between 10 and 30 cm above the surface. Results also showed that cows can contact inappropriately placed stall partitions and the lying surface with considerable force. It was concluded that kinematic techniques could be good indicators of the space required by cows in order to further improve stall design. Further work is needed to assess the space requirements for a wider range of cow sizes and stall configurations.

9 Training cattle to approach a feed source in response to auditory signals

Researchers

Wredle, E.
Rushen. J.
de Passillé, A.M.
Munksgaard, L.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

PAFRC, Agassiz (BC)

Canadian Journal of Animal Science. 2004. Vol. 84, No. 4, p. 567-572.

This study aimed to evaluate whether heifers could be trained to approach a feeder in response to a tone emanating from their collar to see if cow traffic in automated milk systems can be improved using this method. Ten heifers were trained by operant conditioning and eight of them went to the feeder more frequently and in a shorter period of time after the tone than in the control periods. Eight others were trained by classical conditioning. When four heifers were trained while loose in the pen and had a second tone that predicted an aversive treatment, the animals approached the feeder more often after the positive tone. It was concluded that operant conditioning was more effective than classical conditioning and that it is important to define the optimal training procedures before implementing automated milk systems.

10 Vigilance as a measure of fear in dairy cattle

Researchers

Welp, T.
Rushen, J.
Kramer, D.L.
Festa-Bianchet, M.
de Passillé, A.M.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

PAFRC, Agassiz (BC)

Applied Animal Behaviour Science. 2004. Vol. 87, No. 1-2, p. 1-13.

In the course of this research, dairy cattle were tested to determine if time spent vigilant varied according to the novelty of their location, the presence of a dog or the presence of an aversive, gentle or unfamiliar handler. Increased vigilance may indicate increased fear. The first experiment used 40 cows, which were observed individually in a large outdoor enclosure with an attractive food source, in which vigilance time was defined as any time the animal's head was raised. The degree of vigilance decreased as the number of trials increased and was higher in the presence of a dog than in the presence of a human or when neither were present. The second experiment consisted in observing 20 cows in an indoor pen containing an attractive food source with either an aversive, gentle or unfamiliar person nearby. Cows were trained before the testing period to recognize an aversive or a gentle person. Vigilance time was increased when cows were in the presence of the aversive person and vigilance time did not decrease as the number of trials increased. It was concluded that the cows' vigilance is related to their degree of fearfulness towards people and diverse environments so that vigilance may be measured and provide information on the fearfulness of the cows.

11 Calf response to caustic paste and hot-iron dehorning using sedation with and without local anaesthetic

Researchers

Vickers, K.J.
Niel, L.
Kiehlbauch, L.M.
Weary, D.M.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2005. Vol. 88, No. 4, p. 1454-1459.

Dehorning causes pain. Dairy producers should use effective methods to reduce this pain. The use of analgesics may be useful to reduce pain caused by hot-iron dehorning but these interventions are not practical for all producers. Caustic paste is another way to reduce pain associated with dehorning but very little research has been carried out to document the pain associated with caustic burns. Two experiments were therefore performed to assess the pain following dehorning with caustic paste. The pain was assessed by observing head shaking and head rubbing behaviours. In the first experiment, caustic paste, with or without lidocaine local block, was used to dehorn sedated calves. No reductions in pain were shown in calves treated with lidocaine. In the second experiment, the authors compared the response to dehorning with caustic paste with a sedative only and the response to hot-iron dehorning using a sedative and local anaesthetic. Calves dehorned with the hot-iron method shook their heads more than the others. It was concluded that dehorning with a hot-iron and a sedative and local anaesthetic is more painful for calves than using caustic paste with sedative.

12 Can we measure human-animal interactions in on-farm animal welfare assessment? Some unresolved issues

Researchers

de Passilé, A.M.
Rushen, J.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

PAFRC, Agassiz (BC)

Applied Animal Behaviour Science. 2005. Vol. 92, No. 3, p. 193-209.

Stockmanship has an effect on animal welfare. Measures of animal responses to people could possibly be used in on-farm animal welfare assessment. What is discussed here are some unresolved issues related to the efficiency of the current measures of animals' responses to people in on-farm welfare assessment. These measures include the uncertainty about the best type of measure to use, the low reliability of some tests, the difficulties in establishing a clear cut-off point, and questions about the viability of the measures, considering the effects due to the identity of the test person, the location of the test, the influence of motivations other than fear and finally, poor correspondence with the type of handling actually used on farms.

13 Changes in feeding, drinking and standing behavior of dairy cows during the transition period

Researchers

Huzzey, J.M.
von Keyserlingk, M.A.G.
Weary, D.M.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2005. Vol. 88, No. 7, p. 2454-2461.

The purpose of this research was to assess how measures of feeding, drinking and standing behaviour change over the period around calving, to derive objective criteria about the time spent eating and drinking and describe the consistency of these behavioural measures within cows. The measures were taken on 15 transition dairy cows from 10 days before to 10 days after calving. It was observed that the average number of meals per day was higher after calving. But the adverse effect was observed during the time spent eating, which decreased from the pre- to post-calving period. Time spent drinking increased gradually after calving, while the daily time spent standing was similar over the observation period but was higher around calving and lower during the pre-calving period. An important increase in the number of standing bouts was noted on calving day. There are many changes in the feeding behaviour of cows during transition and the results of this study may account for these changes. These results also suggest that cow comfort is important around calving time.

14 Effect of feed barrier design on the behavior of loose-housed lactating dairy cows

Researchers

Endres, M.I.
DeVries, T.J.
von Keyserlingk, M.A.G.
Weary, D.M.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2005. Vol. 88, No. 7, p. 2377-2380.

The effects of two feed barrier systems on the feeding and social behaviour of dairy cows were examined in this study. Two types of feed barriers, post-and-rail and headlock, were tested on 48 lactating Holstein cows. Time spent feeding was not influenced by the feed barrier type, but feeding time changes were observed during periods of peak feeding activity. During those periods, cows that had lower feeding times than group mates when using the post-and-rail barrier were able to increase their feeding times to levels similar to the other cows when using the headlock barrier. Fewer displacements were also observed at the feed bunk when cows used the headlock barrier. The authors concluded that aggressions at the feed bunk may be reduced through the use of a headlock barrier and that this type of barrier also improves the access to feed for socially subordinate cows during peak feeding periods.

15 Effect of flooring type and social grouping on the rest and growth of dairy calves

Researchers

Hanninen, L.
de Passilé, A.M.
Rushen, J.

Applied Animal Behaviour Science. 2005. Vol. 91, No. 3-4, p. 193-204.

The aim of this research was to evaluate the effect of flooring softness and the presence of a companion calf on the growth and rest of calves. Three housing treatments were provided during 20 weeks on one-week-old calves. They were either housed in pairs, in concrete-floor double pens, individually housed in concrete-floor pens, or individually housed in identical pens but with soft rubber mats. The total daily duration of activity, frequency of bouts and mean duration of bouts of total resting, resting on the side or resting on the sternum, were recorded. The daytime effect was also evaluated for various ages. It was found that the mean daily gain and the total time spent resting were positively related. The proportion of the time that calves were resting on the side decreased with age and two-week-old calves were not observed lying on their sides. With the introduction of solid feed, calves spent less time around feeding. The only differences recorded between treatments were that calves housed in pairs in concrete-floor double pens spent more time resting on the side and had a higher bout frequency than calves individually housed in concrete-floor pens. The longer the calves rested, the better they grew, which means that adequate rest is fairly important for calves. It was also found that calves housed in pairs rested more often and for longer periods on their side than individually housed calves.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

PAFRC, Agassiz (BC)

16 Feeding behaviour identifies dairy cows at risk for metritis

Researchers

Urton, G.
von Keyserlingk, M.A.G.
Weary, D.M.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2005. Vol. 88, No. 8, p. 2843-2849.

Early diagnosis of diseases and metabolic disorders after calving is still a challenge for dairy producers. Metritis is a common disease occurring in the time immediately after calving and can produce negative effects on milk yield (MY) and reproductive performance of the cow, but often goes undetected, as there are few visible signs of illness. The purpose of this study was to evaluate whether changes in feeding behaviour in the weeks prior to calving could identify cows at risk for this disease after calving. Feeding behaviour beginning two weeks prior to calving until three weeks after calving was recorded for 26 Holstein cows. The researchers also monitored body temperatures and body condition scores during this period as well as the condition of the vaginal discharge in the weeks after calving. Sixty-nine percent of the cows showed some sign of metritis after calving and these cows spent less time at the feed bunk prior to and after calving. A relationship between the average daily feeding time and the risk of diagnosis for metritis was observed. For each period of 10 minutes decreased in feeding time during the day in the period before calving, cows were two times as likely to be diagnosed with metritis after calving. It was concluded that a reduction in the time spent at the feeder in the precalving period can be used to identify cows at risk for metrits. Further investigation is needed to determine whether this relationship can apply to other diseases and metabolic disorders in transition dairy cows.

17 Free stall maintenance: Effects on lying behaviour of dairy cattle

Researchers

Drissler, M.
Gaworski, M.
Tucker, C.B.
Weary, D.M.

Journal of Dairy Science. 2005. Vol. 88, No. 7, p. 2381-2387.

This study aimed to document how sand-bedding depth and distribution changed within free stalls after new bedding was added as well as the effect of these changes on lying behaviour. A series of three experiments was conducted to achieve this goal. The first experiment consisted in measuring changes in bedding depth during a period of 10 days. Over time, the stall surface became concave and the depth of bedding decreased, with the more important decrease being the day after new sand was added. It was also observed that sand depth decreased more in the centre portion of the stall. In experiment two, changes in the lying behaviour were measured and it was shown that cows spent more time lying down in stalls that had more bedding. For each centimetre decrease in bedding, 11 minutes less were spent lying down by cows on a daily basis. Finally, the third experiment consisted in four treatments varying in sand depth within stalls. Again, reduced levels of bedding resulted in a reduction in lying times.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

18 Frequency of feed delivery affects the behaviour of lactating dairy cows

Researchers

DeVries, T.J.
von Keyserlingk, M.A.G.
Beauchemin, K.A.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2005. Vol. 88, No. 10, p. 3553-3562.

The purpose of this study was to evaluate how the frequency of feed delivery affects the behaviour of group-housed and group-fed dairy cows and the extent of feed sorting. Two experiments were conducted with 48 cows. In the first, cows were delivered feed once a day and twice a day. In the second experiment, they were delivered feed twice a day and four times a day. Increasing the frequency of feed provision caused changes in the distribution of feeding time, resulting in more equal access to feed during the day. Further, daily lying time and incidence of aggressive interactions at the feed bunk were not changed by the frequency of feed delivery. A high frequency of feed delivery did result in subordinate cows being displaced less often than at low frequency. It was also found that the increase in the frequency of feed delivery from one time to two times per day decreased the amount of feed sorting. The authors concluded that access to feed for all cows was improved by the frequent delivery of feed, especially during peak feeding periods and reduced the amount of feed sorting.

19 Hoof pathologies influence kinematic measures of dairy cow gait

Researchers

Flower, F.C.
Sanderson, D.J.
Weary, D.M.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2005. Vol. 88, No. 9, p. 3166-3173.

In this research, gait profiles of cows with no visible injuries, sole lesions, and sole ulcers were studied in order to evaluate how hoof pathologies affect the gait of dairy cattle. Healthy cows walked faster, had shorter stride durations and longer strides. Cows with sole ulcers were more often supported on three legs only to reduce the load on the affected leg. As there were important variations in the number, severity and location of the injuries with sole lesions, few differences were detected between healthy cows and the cows affected by sole lesions. It was concluded that the kinematic gait analysis had a great potential for understanding how hoof pathologies affect dairy cow gait.

20 Influence of neck-rail placement on free-stall preference, use and cleanliness

Researchers

Tucker, C.B.
Weary, D.M.
Fraser, D.

Journal of Dairy Science. 2005. Vol. 88, No. 8, p. 2730-2737.

The object of this study was to assess how the presence of a neck rail at different heights and locations influenced dairy cattle behaviour and stall cleanliness. Four neck-rail heights were compared in a preference test: no neck rail, neck rails of 102, 114 and 127 cm. No preferences were observed in heights. When cows were restricted to each treatment, cows spent less time standing fully in the stall with the lowest neck-rail height and more time in the stall with no neck rail. The distance to the neck rail (constant height) from the curb was evaluated in a second experiment. Cows spent more time fully standing when the neck rail was further from the curb than when it was closer but cows showed increased defecation in the stalls when the neck rail was further. In the third experiment, the soiling of the stall was compared between cows having no neck rail or having a neck rail at a height of 124.5 cm. It was observed that the stalls were soiled more without the neck rail. It was concluded that restrictive neck-rail placement decreased the time cows spent fully standing in the stalls and thus helped keep stalls clean by providing a more comfortable flooring surface outside the stall, which might mitigate the adverse effects of restrictive neck rails.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

21 Physiological and behavioural changes in Holstein calves during and after dehorning or castration

Researchers

Schwartzkopf-Genswein, K.S.
Booth-McLean, M.E.
McAllister, T.A.
Mears, G.J.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Canadian Journal of Animal Science. June 2005. Vol. 85, p. 131-138.

This study aimed to compare physiological and behavioural responses of 17 bull and 12 heifer dairy calves to hot-iron dehorning or dehorning followed by scalpel castration to both control and sham procedures and to each other. To compare these responses, blood samples were collected at various times post-procedure, sham or control. It was observed that cortisol concentrations were high for at least 2 hours following castration and 30 minutes after dehorning. A higher cortisol level was observed after castration then after dehorning, 2 hours and 4 hours after the procedure. Dehorned calves struggled and kicked more than castrated calves. Both castrated and dehorned calves kicked and struggled more than during sham procedures. Both sham and dehorned calves showed higher heart rate compared to control. Calves that were not anaesthetized had higher heart rate, cortisol and more severe behavioural responses to castration and dehorning than sham and control. These different responses may be due to the way calves were handled or to prior dehorning experience.

22 Tie-stall design and its relationship to lameness, injury and cleanliness on 317 Ontario dairy farms

Researchers

Zurbrigg, K.
Kelton, D.
Anderson, N.
Millman, S.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Dairy Science. 2005. Vol. 88, No. 9, p. 3201-3210.

This study aims to identify the relationships between tie-stall design and selected cow based injury, lameness and cleanliness measurements. Lactating dairy cows were evaluated once and scored for neck and hock lesions, broken tails, back arch, hind claw rotation and udder and limb cleanliness. Stall dimensions were recorded as well. It was found that neck lesions were significantly associated with tie-rail height. Positive relationships were found between hock lesions and the presence of an electric trainer and between broken tails and udder and limb cleanliness. Negative relationships were found between hock lesions and tie-chain length as well as between broken tails and tie-rail height. An increase in mean stall length tended to decrease the number of cows having hind-claw rotation. Stall and chain length were negatively associated with the number of dirty cows, which was also positively associated with the presence of an electric trainer. Proportion of cows with clean udders increased with the percentage of cows with clean hind limbs and with tie-rail height. Finally, as the prevalence of clean udders increased, the prevalence of broken tails decreased. These results showed how tie-stall dimensions can influence aspects of dairy cow welfare.

23 Time of feed delivery affects the feeding and lying patterns of dairy cows

Researchers

DeVries, T.J.
von Keyserlingk, M.A.G.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Journal of Dairy Science. 2005. Vol. 88, No. 2, p. 625-631.

The aim of this study was to determine if the daily feeding behaviour patterns of dairy cattle are more affected by the return from milking or by the delivery of fresh feed. Forty-eight cows were exposed to two treatments: milking coinciding with feed delivery and feed delivery 6 hours after milking. It was found that the total daily feeding time increased when cows were fed 6 hours after milking. A high portion of this feeding time occurred during the first hour after feed delivery. Feeding cows 6 hours after they were milked did not affect the lying time of the cows, but did affect their lying patterns, as cows tend to lie down 20 minutes earlier after milking. It was concluded that feeding behaviour was mostly stimulated by the delivery of fresh feed and that changes in feeding management can affect the feeding and lying behaviour of lactating dairy cows.

Environment

1 Mitigation strategies to reduce enteric methane emissions from dairy cows: Update review

Researchers

Boadi, D.
Benchaar, C.
Chiquette, J.
Massé, D.

Canadian Journal of Animal Science. 2004. Vol. 84, No. 3, p. 319-335.

One of the major contributors to the greenhouse gas emissions (GHG) is the enteric methane (CH_4) from ruminants. The enteric methane is also a loss of feed energy during production. This article aimed to provide an update on current management practices and new dietary strategies to reduce CH_4 emissions from ruminants. Some dietary practices, e.g., nutritional changes, have been well researched and applied, such as the addition of ionophores, fats, the use of high-quality forages and the increased use of grains. All these decrease the CH_4 emissions through the manipulation of ruminal fermentation, direct inhibition of the methanogens and protozoa or by a redirection of hydrogen ions away from the methanogens. New mitigation options have been recently identified in the current literature such as the addition in the ration of probiotics, acetogens, bacteriocins, archaeal viruses, organic acids and plant extracts. The immunization and genetic selection of cows have also been identified as potential approaches to decrease CH_4 emissions. However, more research is needed to evaluate the efficiency in vivo of these approaches in decreasing the CH_4 production by dairy cows. The economical cost of these approaches is also to be established as well as their evaluation in terms of GHG budget. Finally, to exploit these strategies, a more basic understanding of the natural differences in the digestion efficiency among animals and a better knowledge of methanogens and their interactions with other organisms in the rumen is needed.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

2 Compatibility of delayed cutting regime with bird breeding and hay nutritional quality

Researchers

Nocera, J.J.
Parsons, G.J.
Milton, G.R.
Fredeen, A.H.

Agriculture Ecosystems and Environment. 2005. Vol. 107, No. 2-3, p. 245-253.

The purpose of this study was to study the breeding phenology of three grassland bird species under delayed cutting regimes (post-1 July) in managed fields of Nova Scotia. The bird species were bobolink *(Dolichonyx oryzivorus)*, savannah sparrow *(Passerculus sandwichensis)*, and Nelson's sharp-tailed sparrow *(Ammodramus nelsoni subvirgatus)*. Peak fledging usually occurred in the first week of July and delaying the cutting by one week in late June or beginning of July led to a slight decrease in the nutritional quality of hay, while a delay of 1.5 week resulted in a decrease in the mean crude protein percentage of 2.1. However, this cutting delay secured an increase in the rate of fledging from 0% to 20% for bobolink, 56% for the savannah sparrow and 44% for Nelson's sharp-tailed sparrow. The maximum fledging rates for all species were obtained through postponing cutting one more week. However, the crude protein percentage loss was of 3.5%, which is not enough to support high maintenance requirements of periparturient cows and feeder/finisher cattle. Nevertheless, this could be made profitable through mineral supplementation. In terms of other nutrients, the acid detergent fibre (ADF) were quite high and Ca and P improved in the same period. The results obtained showed that delayed hay cutting can be a viable option for farmers who decide to conserve breeding birds on hay fields and the possibility of delaying cutting depends on the farm's specialization and the breed kept. These practices may be incorporated in a holistic approach to the agroecosystem management.

Main Canadian Institution

Nova Scotia Agricultural College

Feeding

1 Effects of feeding micronized and extruded flaxseed on ruminal fermentation and nutrient utilization by dairy cows

Researchers

Gonthier, C.
Mustafa, A.F.
Berthiaume, R.
Petit, H.V.
Martineau, R.
Ouellet, D.R.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Journal of Dairy Science. June 2004. Vol. 87, No. 6, p. 1854-1863.

This study evaluates the effects of feeding flaxseed heat-treated on fermentation of nutrients in the rumen and site and extent of nutrient utilization. Four lactating Holstein cows were fed four different diets: no flaxseed, raw flaxseed, micronized flaxseed and extruded flaxseed. The inclusion of flaxseed in the ration increased the proportion of propionate and decreased acetate in the rumen. A lower digestion of acid detergent fibre (ADF) in the rumen was also observed with diets containing flaxseed. Post-ruminal digestibilities of dry matter, organic matter, neutral detergent fibre (NDF) and gross energy were also increased without affecting the ruminal digestion of dry matter, organic matter, NDF, crude protein (CP), fatty acids, and gross energy. Extrusion of flaxseed did not protect against ruminal digestion and the value of undegraded protein in the rumen was increased by the micronization treatment.

2 Effects of subacute ruminal acidosis on sodium bicarbonate-supplemented water intake for lactating dairy cows

Researchers

Cottee, G.
Kyriazakis, I.
Widowski, T.M.
Lindinger, M.I.
Cant, J.P.
Duffield, T.F.
Osborne, V.R.
McBride, B.W.

Main Canadian Institution

University of Guelph

Journal of Dairy Science. July 2004. Vol. 87, No. 7, p. 2248-2253.

The object of this study was to determine the effect of SARA on supplemented water intake. Four multiparous cows were induced SARA and given the choice between sodium-bicarbonate supplemented water and normal water. The induction of SARA decreased the daily pH of the rumen as well as the total mixed ration (TMR) intake. The total water intake was increased with greatest depression periods of ruminal pH of cows subjected to SARA. There was an overall preference for sodium-bicarbonate supplemented water during both control and SARA periods.

3 Influence of parturition and diets enriched in n-3 or n-6 polyunsaturated fatty acids on immune response of dairy cows during the transition period

Researchers

Lessard, M.
Gagnon, N.
Godson, D.L.
Petit, H. V.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Journal of Dairy Science. July 2004. Vol. 87, No. 7, p. 2197-2210.

The purpose of this study was to determine the functional properties of immunocompetent cells in dairy cows during the transition period receiving a diet enriched in n-3 or n-6 polyunsaturated fatty acids. In this study, 21 primiparous and 27 multiparous Holstein cows were fed three different rations; with Megalac (rich in saturated and monounsaturated fatty acids), micronized soybeans (rich in n-6 fatty acids) or whole flaxseed (rich in n-3 fatty acids). In order to measure the immune response in colostrum and serum, cows received two subcutaneous injections of ovalbumin, one at week 6 and one at week 3 before calving. Proliferative response to concanavalin A and the in vitro productions of interferon-gamma, tumour necrosis factor-alpha, nitric oxide and prostaglandin E2 were also assessed with a culture of blood mononuclear cells. The authors concluded that during the transition period, the functional properties of lymphocytes and monocytes/macrophages lineage are modulated by parturition and by the composition of polyunsaturated fatty acids in the ration.

4 Effects of feeding or abomasal infusion of canola oil in Holstein cows-1. Nutrient digestion and milk composition

Researchers

Chelikani, K.
Bell, A.
Kennelly, J.

Main Canadian Institution

UNIVERSITY OF ALBERTA

Journal of Dairy Research. August 2004. Vol. 71, No. 3, p. 279-287.

The purpose of this study was to assess the effects of feeding or infusing canola oil (into the abomasum) on rumen fermentation, nutrient digestibility, duodenal flows of fatty acids and milk composition of dairy cows. Five Holstein cows were given three different treatments; a control treatment, a supplement of canola oil in the diet and an abomasal infusion of canola oil. The canola oil supplement in the diet did not affect feed intake, ruminal fermentation characteristics and digestibilities of nutrients in the rumen or total tract but increased duodenal flows and concentration of some fatty acids in milk. The infusion of canola oil had an adverse effect on feed intake, production of volatile fatty acids, flow of nutrients in the intestine, digestibility and yields of fatty acids in milk and fat content in milk. Both treatments with canola oil decreased the proportions of saturated and medium-chain fatty acids and increased 18:1 in milk. The infusion of canola oil also had a positive effect on concentrations of 18:2n-6 and 18:3n-3 in milk. The authors concluded that a supplement of canola oil decreased saturated fatty acids and increased unsaturated C18 in milk. However, infusing canola oil into the abomasum produced adverse effects on nutrient digestion.

5 Effects of feeding or abomasal infusion of canola oil in Holstein cows. 2.Gene expression and plasma concentrations of cholecystokinin and leptin

Researchers

Chelikani, K.
Glimm, R.
Keisler, H.
Kennelly, J.

Main Canadian Institution

UNIVERSITY OF ALBERTA

Journal of Dairy Research. August 2004. Vol. 71, No. 3, p. 288-296.

This study examined the influence of CCK, leptin and fatty acid (FA) concentrations in plasma in mediating the satiety effects of supplemental fat in lactating cows. Five late lactating Holstein cows were fed three different rations; one for control, one with a dietary supplementation of canola oil and one with an abomasal infusion of canola oil. Results showed there was a reduction in feed intake with the abomasal infusion of canola. Furthermore, both treatments with canola oil stimulated the expression of the CCK gene in the duodenum and increased the concentration of CCK in the plasma. Canola oil supplementation did not affect the mRNA abundance of leptin, lipoprotein lipase, acetyl-CoA carboxylase in adipose tissue and did not affect plasma concentrations of leptin, insulin and IGF-I either. Abomasal infusions of canola oil also increased plasma concentrations of 18:1n-9 and 18:2n-6. It was concluded that the hypophagic effects of fat supplementation depended on the amount of unsaturated fatty acids reaching the intestine. This satiety effect is mediated through CCK, oleic acid and/or linoleic acid, but leptin is not involved.

6 Grain processing, forage-to-concentrate ratio and forage length effects on ruminal nitrogen degradation and flows of amino acids to the duodenum

Researchers

Yang, W.Z.
Beauchemin, K.A.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Journal of Dairy Science. August 2004. Vol. 87, No. 8, p. 2578-2590.

The object of this study was to evaluate the effects of barley grain processing (coarse or flat), forage-to-concentrate ratio (high or low) and forage particle length (long or short). These dietary factors were evaluated on the degradability of N in the rumen, microbial protein synthesis, duodenal flows and digestibility of AA in the intestines and in the total tract. Eight cows were fed TMR at will. A greater forage-to-concentrate ration increased the passage of microbial protein to the duodenum, increased digestibility of N in the rumen, decreased the flow of dietary AA and increased the flow of microbial AA. The shorter forage particle length increased the passage of microbial protein to the duodenum, decreased the digestion of N in the intestine as well as it decreased the flow of dietary AA to the duodenum. Increased grain processing improved the digestibility of N in the intestine and in the total tract, enhanced duodenal flow of AA and increased the flow of many individual a AA as well as their digestibility. Interactions between dietary factors were also observed. Processed barley combined with long forage particle length increased Arg, Thr, Asp, Glu, Ser, Tyr and non-essential amino acids (NEAA).

7 Performance of dairy cows fed roasted sunflower seeds

Researchers

Sarrazin, P.
Mustafa, A.F.
Chouinard, P.Y.
Raghavan, G.S.V.
Sotocinal, S.A.

Main Canadian Institution

McGill

Journal of the Science of Food and Agriculture. August 2004. Vol. 84, No. 10, p. 1179-1185.

The purpose of this study was to evaluate the effects of feeding roasted whole sunflower seeds to dairy cows on milk yield (MY), milk composition, ruminal fermentation and total tract nutrient utilization. Nine Holstein cows were fed three different diets; a control diet, a raw sunflower seeds diet and a roasted sunflower seed diet. The inclusion of sunflower seeds in the diet decreased dry matter intake as well as milk fat content and yield relative to the control diet. It also decreased the concentrations of short-chain and medium-chain fatty acids, while it increased those of long-chain fatty acids. Sunflower seeds in the diet also decreased the concentration of acetate and increased the concentration of propionate. The authors concluded that feeding sunflower seeds improved the efficiency of milk production as well as concentrations of long-chain and polyunsaturated fatty acids. However, roasting the sunflower seeds had no additional benefits on MY or milk FA composition.

8 Replacing chopped alfalfa hay with alfalfa silage in barley grain and alfalfa-based total mixed rations for lactating dairy cows

Researchers

Plaizier, J.C.

Main Canadian Institution

University of Manitoba

Journal of Dairy Science. August 2004. Vol. 87, No. 8, p. 2495-2505.

The object of this study was to evaluate the effects of replacing chopped alfalfa hay with alfalfa silage in barley grain and alfalfa-based total mixed rations (TMR). It was observed that replacing chopped alfalfa hay by alfalfa silage reduced dry matter in the ration. It also increased soluble protein and physical effective NDF without having any effect on dry matter intake, rumen pH, rumen volatile fatty acids, blood lactate, milk fat and milk protein percentage. However, it decreased blood glucose, MY and protein yield in milk. It also tended to increase blood urea. The authors suggested that a mild subacute acidosis was induced by all the rations provided.

9 Trichoderma enzymes promote Fibrobacter succinogenes S85 adhesion to, and degradation of, complex substrates but not pure cellulose

Researchers

Morgavi, Diego P.
Beauchemin, Karen A.
Nsereko, Victor L.
Rode, Lyle M.
McAllister, Tim A.
Wang, Yuxy.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Journal of the Science of Food and Agriculture. August 15, 2004. Vol. 84, No. 10, p. 1083-1090.

The purpose of this study was to better understand the effects of feeding enzymes additives on the digestion of fibre by ruminants. The authors used an enzyme preparation made of *Trichoderma longibrachiatum* (TE) and evaluated the effects of its addition on adhesion and growth of bacteria that digests fibre in the rumen (*Fibrobacter succinogenes* S85). For the adhesion experiment, they used crystalline cellulose, alfalfa hay and corn silage and for the growth experiment, crystalline cellulose and corn silage. In the case of pure cellulose (crystalline), the addition of the enzyme preparation made of TE decreased bacterial adherence to fibre. As for corn, the addition of TE increased NDF disappearance and stimulated growth rate and gas production. The addition of TE at a low concentration also increased the adhesion of bacteria to fibre as well as the degradation of fibre.

10 Use of synchrotron Fourier transform infrared microspectroscopy to identify chemical differences in barley endosperm tissue in relation to rumen degradation characteristics

Researchers

Yu, P.
Christensen, D.A.
Christensen, C.R.
Drew, M.D.
Rossnagel, B.G.
McKinnon, J.J.

Main Canadian Institution

University of Saskatchewan

Department of Animal and Poultry Science

Canadian Journal of Animal Science. September 2004. Vol. 84, No. 3, p. 523-527.

With SR-FTIR microspectroscopy, it is possible to explore the chemical makeup of intact plant tissue with a high signal-to-noise ratio at fine spatial resolution, which is not the case with traditional "wet" chemical analysis. The purpose of this study was to use SR-FTIR microspectroscopy to explore and identify chemical differences in the ultra-structural matrix of the endosperm tissue of the Valier and Harrington barley varieties, which are related to differences in rumen degradation characteristics. The authors observed a variation, not significant, in the infrared (IR) absorbance intensity of starch and protein between the two varieties. There was a wider range of starch-to-protein IR absorbance intensity ratio with Harrington but a lower ratio of starch-to-protein IR absorbance intensity for Valier. It was concluded that the chemical makeup of intact plant tissues can be carried out by SR-FTIR microspectroscopy at ultra-spatial resolution.

11 Effects of alfalfa particle size and specific gravity on chewing activity, digestibility and performance of Holstein dairy cows

Researchers

Yansari, A.T.
Valizadeh, R.
Naserian, A.
Christensen, D.A.
Yu, P.
Shahroodi, F.E.

Main Canadian Institution
University of Saskatchewan
Department of Animal and Poultry Science

Journal of Dairy Science. November 2004, Vol. 87, No. 11, p. 3912-3924.

The purpose of this study was to investigate the effects of alfalfa particle size and functional specific gravity (FSG) on chewing activity, digestibility, rumen kinetics and production of lactating dairy cows fed diets based on corn silage. Two experiments were carried out. In the first, the authors determined the water-holding capacity (WHC), insoluble dry matter, hydration rate and FSG changes in alfalfa hay and corn silage. The results were that a reduction in particle size increased bulk density, FSG and hydration rate, while it decreased alfalfa's WHC. The second experiment consisted in feeding nine Holstein dairy cows TMR containing three sizes of alfalfa hay. A reduction in particle size decreased the rumen pH, total chewing activity, rumination, eating time and milk fat, while it increased milk protein, bulk density, FSG and hydration rate of alfalfa. The authors concluded that the most influential factor affecting dry matter intake, milk composition and chewing behaviour is the reduction of forage particle size.

12 Effects of feeding whole, unprocessed sunflower seeds and flaxseed on milk production, milk composition and prostaglandin secretion in dairy cows

Researchers

Petit, H.V.
Germiquet, C.
Lebel, D.

Main Canadian Institution
Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada
DSRDC, Lennoxville (QC)

Journal of Dairy Science. November 2004. Vol. 87, No. 11, p. 3889-3898.

In this study, the effects of different fat sources on milk production and composition, N utilization, follicular development and prostaglandin secretion were evaluated. Four cows were fed four different TMR containing different fat sources, calcium salts of palm oil (Megalac), whole flaxseed, whole sunflower seeds and no fat source. Ether extract digestibility was lower for cows that were not fed any fat source, while digestibility and feed intake were similar for the other sources of fat. Cows fed whole flaxseed and Megalac showed a higher MY. But milk protein concentration in milk was lower with Megalac. Concentrations of n-3 fatty acids were higher and then n-6: n-3 fatty acids ratio lower with whole flaxseed. The authors also observed that the concentration of 13, 14-dihydro-15-keto-PGF2alpha in plasma were higher for cows having had the sunflower diet. It was suggested that diets containing high proportions of n-6 fatty acids (sunflower seeds) increase the secretion in blood of series 2 prostaglandins.

13 Chemical composition and in situ ruminal nutrient degradability of normal and brown midrib forage pearl millet grown in southwestern Quebec

Researchers

Mustafa, A.F.
Hassanat, F.
Seguin, P.

Main Canadian Institution

McGill

Canadian Journal of Animal Science. December 2004. Vol. 84, No. 4, p. 737-740.

This study aims to evaluate the chemical composition and in situ ruminal degradability of normal and brown midrib (BMR) forage pearl millet grown in southwestern Quebec conditions. BMR forage pearl millet was harvested twice during the season. It was found that BMR millet contained less NDF and acid detergent lignin than the normal genotype and more crude protein. The first harvest showed a higher crude protein content than the second harvest. In situ ruminal degradabilities of dry matter, crude protein and NDF were higher for BMR than for the normal genotype without being affected by harvest.

14 Effects of dietary fenugreek seed on dairy cow performance and milk characteristics

Researchers

Shah, M.A.
Mir, P.S.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Canadian Journal of Animal Science. December 2004. Vol. 84, p. 725-729.

The aim of this research was to study the effects of providing fenugreek seed at a rate of 20% of the dry matter of the ration on dairy cow performance and milk characteristics. The study period was for three weeks. It resulted in an improved profile of functional fatty acids in milk and decreased the concentration of blood cholesterol. It also decreased the cholesterol concentration in milk. Furthermore, milk flavour or taste was not affected by the inclusion of fenugreek seed in the diet. It was concluded that these could be used as a means to improve milk characteristics.

15 Effects of mechanical processing on the nutritive value of barley silage for lactating dairy cows

Researchers

Eun, J.S.
Beauchemin, K.A.
Hong, S.H.
Yang, W.Z.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Journal of Dairy Science. 87(2). December 2004. p. 4170-4177.

The purpose of this study was to evaluate the effects of feeding mechanical processed barley silage to lactating dairy cows as the main source of forage in their diet. The impacts of feeding mechanical processed barley silage have been evaluated on milk production, dry matter intake and body weight. For the purpose of this study, 24 Holstein cows were fed two different TMR; one with regular barley silage, the other with mechanical processed barley silage. The authors demonstrated that feeding mechanical processed barley silage had no impacts on dry matter intake, MY, milk composition, digestibility of dry matter and nutrients, save for starch. It was also found that the treatment had no effect on body weight, body condition score and degradation of dry matter in the rumen. Overall, mechanically processing barley silage did not significantly improve milk production and resulted in minor improvements of the nutritive value of barley silage and of its digestibility.

16 Model prediction of nutrient supply to ruminants from processed field tick beans

Researchers

Yu, P.
Christensen, D.A.

Main Canadian Institution

University of Saskatchewan

Department of Animal and Poultry Science

Asian-Australasian Journal of Animal Sciences. December 2004. Vol. 17, No. 12, p. 1674-1680.

This study aims to compare the Dutch truly absorbed protein in the small intestine/degraded protein balance (DPB) (DVE/OEB) system and the NRC-2001 model in the prediction of protein supply to dairy cows using processed field tick beans. The parameters evaluated are the ruminally synthesized microbial crude protein, the DVE/OEB. It was shown that the two models had significant correlations in their predicted values. However, the average microbial protein supply based on available energy was higher. The DVE/OEB were lower with the DVE/OEB system than with the NRC-2001 model. The authors concluded that these differences should be attributed to factors that differed considerably in the calculations of the two models.

17 Nutritional practices on Manitoba dairy farms

Researchers

Plaizier, J.C.
Garner, T.
Droppo, T.
Whiting, T.

Main Canadian Institution

University of Manitoba

Canadian Journal of Animal Science. December 2004. Vol. 84, No. 3, p. 501-509.

In order to document nutritional practices, compositions of diet and study relationships between diet composition and milk production, a survey was carried out on 40 farms across Manitoba. The results of the study showed that more farms are feeding TMR than component feeding and that only a small portion of farms working with TMR are using more than one ration in their dairy herd. In general, diets fed in Manitoba contain more net energy of lactation, rumen degradable protein, calcium, phosphorus, potassium, magnesium and sodium and less relative lag time (RLT) than general recommendations. It was also found that MY and milk fat percentage were affected by breed but not by feeding practices, diet composition and physically effective neutral detergent fibre (peNDF). There was a positive relationship between milk protein percentage and rumen undegradable protein as well as between milk urea nitrogen and rumen degradable protein, rumen undegradable protein, NDF and days in milk. Results of the study also suggests that reductions in crude protein, rumen degradable protein, Ca, P, Mg and K in the ration could contribute to reduce nutrient excretions in the environment without affecting milk production and health. Finally, it was also concluded that increasing the amount of rumen undegradable protein in rations could improve milk production on dairy farms in Manitoba.

18 Comparison of predictions of digestible supply and measurements of net portal fluxes of essential amino acids in lactating dairy cows

Researchers

Pacheco, D.
Lapierre, H.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Journal of Animal and Feed Sciences. 2004. Vol. 13, Suppl. 1. p. 327-330.

The digestible supply of AA predicted with the National Research Council (NRC) or the Cornell Net Carbohydrate and Protein System (CNCPS) were compared with measurements of net portal absorption in dairy cows. The estimated digestible flow of AA obtained from both models are good predictors of the AA profile flowing into the portal vein. However, for absolute amounts, the NRC model more closely predicts the changes measured in net portal fluxes compared to the CNCPS. The slopes of the regression "AA net portal flux vs. AA digested-NRC" indicated losses of branched-chain AA (oxidation) and Thr (endogenous loss) through metabolism across the gut with smaller losses for Lys. Slopes greater than unity for His, Met and Phe suggest either an underestimation of the digestible flow with the NRC model or an overestimation of the net portal fluxes for these AA.

19 Effect of level of metabolizable protein on splanchnic flux of amino acids in lactating dairy cows

Researchers

Raggio, G.
Pacheco, D.
Berthiaume, R.
Lobley, G.E.
Pellerin, D.
Allard, G.
Dubreuil, P.
Lapierre, H.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Journal of Dairy Science. 2004. Vol. 87, No. 10, p. 3461-3472.

This study aims to determine the response of the metabolism of splanchnic tissue to different levels of metabolizable protein (MP). Six lactating dairy cows were fed three different rations varying in the amount of MP provided–low, medium and high. Increasing MP supply increased milk protein yield (13%) to a lesser extent than urinary excretion, which was more than doubled. Concomitant to an increased catabolism of the EAA in the liver (histidine, methionine, phenylalanine and threonine), the efficiency of transfer of absorbed EAA into milk protein decreases markedly as protein supply increases. The efficiency of transfer of absorbed AA into milk varies also greatly between AA. These two important factors should be taken into account when building predictive schemes for milk protein output.

20 Effects of barley silage chop length on productivity and rumen conditions of lactating dairy cows fed total mixed rations

Researchers

Einarson, M.S.
Plaizier, J.C.
Wittenberg, K.M.

Main Canadian Institution

University of Manitoba

Journal of Dairy Science. 2004. Vol. 87, No. 9, p. 2987-2996.

The object of this study was to assess the effects of barley chop length on productivity and rumen conditions of lactating dairy cows fed TMR. The barley silage was chopped long or short, ensiled and then mixed into TMR containing either a low or high percentage of concentrates. A reduction in barley chop length decreased the proportion of TMR particles retained by the 8- and 19-mm screens of the Penn State Particle Separator (PSPS) and dietary physically effective (pe) fibre for both levels of concentrates. It also increased the dry matter intake and rumen propionate again for both levels of concentrates. Increasing the level of concentrates in the diet reduced rumen pH and milk fat content and increased MY and milk protein content.

21 Effects of feeding either fresh alfalfa or alfalfa silage on milk fatty acid content in Holstein dairy cows

Researchers

Whiting, C.M.
Mutsvangwa, T.
Walton, J.P.
Cant, J.P.
McBride, B.W.

Main Canadian Institution

UNIVERSITY of GUELPH

Animal Feed Science and Technology. 2004. Vol. 113, No. 1-4, p. 27-37.

The purpose of this study was to evaluate the effects of feeding fresh alfalfa or alfalfa silage on profiles of fatty acids in milk of Holstein dairy cows. The experiment was carried out in two periods of five weeks each. Sixteen cows were fed either fresh alfalfa or alfalfa silage. Feeding fresh alfalfa resulted in a higher feed intake, proportions of stearic, oleic, linoleic and linoleic acids in milk fat while proportions of myristic and palmitic acids were lower. Overall, the inclusion of fresh alfalfa in the diet resulted in a lower content of saturated fatty acids and a higher content of polyunsaturated fatty acids in milk fat compared with feeding alfalfa silage.

22 Feeding micronized and extruded flaxseed to dairy cows: Effects on digestion and ruminal biohydrogenation of long-chain fatty acids

Researchers

Gonthier, C.
Mustafa, A.F.
Berthiaume, R.
Petit, H.V.
Ouellet, D.R.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Canadian Journal of Animal Science. 2004. Vol. 84, No. 4, p. 705-711.

The object of this study was to find out the effects of feeding micronized and extruded flaxseed on biohydrogenation (BH) and digestibility of fatty acids (FA) in the gastrointestinal tract. Four lactating Holstein cows were each fed a different diet: no flaxseed, raw flaxseed, micronized flaxseed and extruded flaxseed for a 21-day adaptation period plus 7 days to collect data. The inclusion of flaxseed in the ration of lactating dairy cows increased the flow of polyunsaturated fatty acids in the duodenum. The heat treatments did not protect unsaturated fatty acids in the rumen against ruminal BH.

23 Risk factors for milk off-flavours in dairy herds from Prince Edward Island, Canada

Researchers

Mounchili, A.
Wichtel, J.J.
Keefe, G.P.
Halliday, L.J.

Main Canadian Institution

Preventive Veterinary Medicine. 2004. Vol. 64, No. 2-4, p. 133-145.

The object of this study was to investigate potential risk factors within a herd for milk off-flavours in bulk tanks of Prince Edward Island dairy herds as these have shown a sudden increase in their incidence since the late 1990s. Data were recorded from 2000 until 2002 from 62 dairy herds identified off-flavour-positive and 62 dairy herds identified off-flavour-negative. It was found that in the dairy herds identified off-flavour-positive, 69% of off-flavours were classified as feed, 15% as rancid, 10% as oxidized and 6% as malty. As the incidence of feed off-flavours was way more important than the other sources of off-flavours, only this one was considered in the risk factor analysis. The authors identified a relationship between the poor air quality in the lactating cows' barn using baled silage as the main forage and feeding as roughage before milking or as a free choice with the incidence of off-flavours present in bulk tank milk. However, some practices were found to be protective against the transmission of off-flavours in milk such as udder hair clipping and changing the bedding material more than once a day. These results raised hypotheses concerning silage composition and silage-making processes.

24 Effect of urea supplementation on urea kinetics and splanchnic flux of amino acids in dairy cows

Researchers

Ouellet, D.R.
Berthiaume, R.
Girard, C.
Dubreuil, P.
Babkine, M.
Lobley, G.E.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Journal of Animal and Feed Sciences. 2004. Vol. 13, suppl. No. 1, p. 319-322.

It has been suggested that a large absorption of ammonia would impose a penalty to the ruminant by increasing hepatic removal of AA to support increased synthesis of urea. The aim of this project was to determine, in lactating dairy cows, if increased hepatic ureagenesis would affect hepatic removal of AA. Hepatic ureagenesis accounted for all whole body urea production and both increased with urea supplementation. Neither liver removal of EAA or milk protein yield was affected by urea supplementation. Recycling of urea into the gut and its partition between anabolic and catabolic fates were also unaltered by treatment. Saliva contributed to 0.31 to 0.50 of urea gut entry rate. In cows producing 32 kg/d of milk and fed a diet supplying 157g CP/kg DM, increased hepatic ureagenesis did not result in decreased post-liver supply of EAA and subsequent milk protein yield.

25 Heat- and lignosulfonate-treated canola meal as a source of ruminal undegradable protein for lactating dairy cows

Researchers

Wright, C.F.
von Keyserlingk, M.A.G.
Swift, M.L.
Fisher, L.J.
Shelford, J.A.
Dinn, N.E.

Journal of Dairy Science. January 2005. Vol. 88, No. 1, p. 238-243.

The purpose of this experiment was to assess the processing efficiency with moist heat or moist heat combined with lignosulfonate (LSO3) as a means of increasing the ruminal undegradable fraction of canola meal used as a protein supplement for lactating dairy cows. Eighteen Holstein lactating cows were fed diets containing either untreated canola meal, heat-treated canola meal or heat- and LSO3-treated canola meal. Feeding heat- and LSO3-treated canola meal increased dry matter intake and apparent digestibilities of neutral and ADF. Milk production was also increased with heat- and LSO3-treated canola meal relative to untreated but not to heat-treated canola meal. Feeding heat- and LSO3-treated canola meal also decreased urinary excretion of nitrogen (as a % of N intake), digestibility of crude protein, concentrations of N ammonia in the rumen, blood urea nitrogen and milk urea nitrogen. They concluded that moist heat combined with LSO3 treatment of canola meal succeed in increasing the proportion of crude protein digested in the lower digestive tract, which means that processing canola meal with heat and LSO3 provided a more efficient use of proteins than non-processed or moist heat-treated canola meal.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

26 Effects of intramuscular injections of vitamin B_{12} on lactation performance of dairy cows fed dietary supplements of folic acid and rumen-protected methionine

Researchers

Girard, C.L.

Matte, J.J.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Journal of Dairy Science. February 2005. Vol. 88, No. 2, p. 671-676.

The object of this study was to evaluate the effects of intramuscular injections of vitamin B_{12} on lactational performance of primiparous dairy cows that are fed folic acid and rumen-protected methionine supplements. The study was carried out from week 4 to week 18 of lactation. Fourteen Holstein cows were fed rations with rumen-protected methionine and folic acid plus a weekly intramuscular injection of saline or of vitamin B_{12}. It was found that a supplement of vitamin B_{12} increased energy-corrected milk, MY of solids, fat and lactose. It also increased the concentrations and amounts of vitamin B_{12} secreted in milk, packed cell volume, blood haemoglobin and serum vitamin B_{12}, but decreased serum methylmalonic acid. These results support the hypothesis that the vitamin B_{12} supplementation was not optimal and limited the cows' performance in early lactation.

27 Feeding micronized and extruded flaxseed to dairy cows: Effects on blood parameters and milk fatty acid composition

Researchers

Journal of Dairy Science. February 2005. Vol. 88, No. 2, p. 748-756.

Gonthier, C.
Mustafa, A.F.
Ouellet, D.R.
Chouinard, P.Y.
Berthiaume, R.
Petit, H.V.

The object of this study was to evaluate the effects of feeding extruded and micronized flaxseed to late lactating dairy cows on milk composition and blood profile. Four lactating Holstein cows were each fed one of four rations: no flaxseed, raw flaxseed, micronized flaxseed and extruded flaxseed. Cows were fed these rations for a period of 28 days consisting in 21 days for adaptation and 7 days to record data. Results showed that feeding flaxseed reduced MY, energy-corrected milk, yields of milk protein and casein, plasma concentrations of medium-chain and saturated fatty acids, and concentrations of short-chain, medium-chain and saturated fatty acids in milk fat. The authors observed an increase in plasma cholesterol and non-esterified fatty acids (NEFA), an increase in the long-chain and monosaturated fatty acids concentrations and an increased average in conjugated linoleic acid concentrations (CLA) as a result of the supplementation of flaxseed. They concluded that the inclusion of flaxseed in the diet of dairy cows, either raw or heated, changed blood and milk FA composition. In the case of the two treatments, it was found that the extrusion treatment had negative effects on MY and composition compared to micronization treatment. Flaxseed supplementation increased average concentrations of C18:3 and CLA by 152% and 68%, respectively.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

28 Effects of dietary sunflower seeds on lactation performance and conjugated linoleic acid content of milk.

Researchers

He, M.L.
Mir, P S.
Beauchemin, K.A.
Ivan, M.
Mir, Z.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Canadian Journal of Animal Science. March 2005. Vol. 85, No. 1, p. 75-83.

In this study, the authors evaluated the effects of sunflower seeds in the diet of lactating dairy cows on the concentration of CLA in milk and lactation performance. They investigated the effects on daily dry matter intake, milk production, milk content in protein and lactose, fatty acids composition in milk, and body weight. These parameters were recorded for a period of 12 weeks on 25 multiparous and primiparous cows. It was found that the inclusion of sunflower seeds at 7% of the dry matter content of the ration increased the concentration of CLA and yield in milk. However, adding sunflower seeds in the diet did not improve the yield and content of milk fat, protein and lactose and although it doubled the content and yield of conjugated inoleic acid over the entire 12-week period and that factor was measured. It did not affect, body weight, body condition score, dry matter intake, nor milk production.

29 Effects of pe fibre on digestion and milk production by dairy cows fed diets based on corn silage

Researchers

Yang, W.Z.
Beauchemin, K.A.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Journal of Dairy Science. March 2005. Vol. 88, No. 3, p. 1090-1098.

This study aims to determine the effects of a variation in the peNDF content in diets based on corn silage, digestion and milk production of lactating dairy cows. The parameters evaluated were nutrient intakes, site and extent of digestion, milk production and microbial protein synthesis. Six lactating dairy cows were fed the same ration, the only variable being the corn silage particle length, related to the peNDF content. Three peNDF contents were evaluated (high, medium and low). It was found that an increase in peNDF content increased the total peNDF intake and improved digestibility of all nutrients (fibre particularly), save for starch. It also enhanced microbial protein synthesis in the rumen. Nevertheless, the variation in the particle length of corn silage did not have any effects on dry matter, NDF, starch and nitrogen intake, nor did it affect milk production and its composition.

30 Prediction of protein supply to ruminants from concentrates: Comparison of the NRC-2001 model with the DVE/OEB system

Researchers

Yu, P.

Main Canadian Institution

University of Saskatchewan

Department of Animal and Poultry Science

Journal of the Science of Food and Agriculture. March 2005. Vol. 85, No. 4, p. 527-538.

This study aims to compare the DVE/OEB system with the NRC-2001 model in the prediction of supply of protein to dairy cows from 46 selected concentrates: malting-type barley, feed-type barley, field tick beans, white albus lupins, whole soybeans and horse beans. The barleys have been processed coarse and fine. Parameters evaluated for the comparison were ruminally synthesized microbial protein and DVE/OEB. The authors found there were significant correlations between the predicted values of the two models. However, the average microbial protein supply based on available energy and truly absorbed protein in the small intestine were lower with the DVE/OEB than what was predicted by the NRC-2001 model, while the degraded protein balances (DPB) prediction was higher. These differences are due to factors used in the calculations for the two models.

31 Subacute ruminal acidosis induces ruminal lipopolysaccharide endotoxin release and triggers an inflammatory response

Researchers

Gozho, G.N.
Plaizier, J.C.
Krause, D.O.
Kennedy, A.D.
Wittenberg, K

Main Canadian Institution

University of Manitoba

Journal of Dairy Science. April 2005. Vol. 88, No. 4, p. 1399-1403.

In this study, the authors demonstrated that SARA induced ruminal lipopolysaccharide endotoxin release and triggered an inflammatory response. To demonstrate the fact, they induced SARA in three Jersey steers. It was found that blood concentrations of haptoglobin and serum amyloid-A were increased as a result of the SARA induction as well as decreased dry matter intake. Feeding grain to steers also increased lipopolysaccharide concentration compared to feeding hay. These results showed that a systemic inflammatory response was activated by the induction of SARA.

32 Effects of flaxseed on protein requirements and N excretion of dairy cows fed diets with two protein concentrations

Researchers

Petit, H.V.
Ivan, M.
Mir, P. S.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Journal of Dairy Science. May 2005. Vol. 88, No. 5, p. 1755-1764.

The object of this study was to assess the effects of including flaxseed in the diet of mid-lactating cows on protein requirement and N excretion in urine and faeces as well as on MY and composition, intake and digestibility. Mid-lactating cows were fed four different TMR containing either no flaxseed and 16% protein, whole flaxseed and 16% protein, no flaxseed and 18% protein or whole flaxseed and 18% protein. Cows that were fed higher protein diets and those that were not fed flaxseed had greater dry matter intake. MY was lower in the case of cows fed medium protein with flaxseed than it was for cows fed high protein without flaxseed. The addition of flaxseed in the diet decreased milk protein concentration and digestibility, while having no effect on milk fat concentration, which was decreased using the high protein diet. Digestibility was also reduced using the lower protein diet. In the case of N excretion, flaxseed increased its secretion in faeces and N was less retained in cows fed flaxseed. The addition of flaxseed in cows' diet also decreased concentrations of short and medium-chain fatty acids and increased long-chain fatty acids in milk.

33 Effects of including chopped alfalfa hay in barley-based total mixed rations on production and rumen fermentation of lactating dairy cows

Researchers

Einarson, M.S.
Plaizier, J.C.
Wittenberg, K.M.

Main Canadian Institution

University of Manitoba

Canadian Journal of Animal Science. June 2005. Vol. 85, No. 2, p. 251-253.

The object of this study was to evaluate the effects of including chopped alfalfa hay in barley-based TMR on production and rumen fermentation of lactating dairy cows. The authors replaced the alfalfa silage in diets containing barley silage and barley-grain-based TMR by chopped alfalfa hay. The replacement of alfalfa silage by chopped alfalfa hay increased dry matter content in the diet, decreased physical effective fibre, increased dry matter intake, and reduced the yield of milk protein without having any effect on MY, milk fat, rumen pH and rumen ammonia.

34 Effects of monensin on meal frequency during sub-acute ruminal acidosis in dairy cows

Researchers

Lunn, D.E.
Mutsvangwa, T.
Odongo, N.E.
Duffield, T.F.
Bagg, R.
Dick, P.
Vessie, G.
McBride, B.W.

Main Canadian Institution

UNIVERSITY of GUELPH

Canadian Journal of Animal Science. June 2005. Vol. 85, No. 2, p. 247-249.

The purpose of this study was to evaluate the effects of monensin on meal frequency during grain-induced SARA in Holstein dairy cows. Two experiments were conducted with two different forms of monensin; Rumensin controlled-release capsule (CRC) and Rumensin Premix. Meal frequency with both treatments was lower during SARA. The meal frequency during SARA and the recovery period was increased in the second experiment (Rumensin Premix). The authors concluded that monensin premix could increase meal frequency of lactating dairy cows affected by SARA.

35 Effects of pe fibre on intake, chewing activity and ruminal acidosis for dairy cows fed diets based on corn silage

Researchers

Beauchemin, K.A.
Yang, W.Z.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Journal of Dairy Science. June 2005. Vol. 88, No. 6, p. 2117-2129.

The purpose of this study was to assess the effects of a variation in the content of peNDF in the ration for lactating dairy cows that contains only corn silage as a source of forage. The authors looked into the effects of this variation on different parameters, namely daily feed intake, meal patterns, chewing activity and rumen pH, related to ruminal acidosis. Six lactating dairy cows were fed an identical corn silage diet, but the peNDF content of the diets varied according to the length of the corn silage particles. Three different peNDF contents were used; high (original corn silage), medium (re-chopped once) and low (re-chopped twice). It was demonstrated that an increase in the corn silage particle length increased the daily intake in peNDF as well as the number of meals per day, but there was no effect on dry matter and NDF total intake. It also revealed a positive relationship between the peNDF, the number of chews per day and the chewing time. However, while the dietary particle size (peNDF) in the diet is a good indicator of the chewing activity of lactating dairy cows, it did not have any significant effect on rumen pH, which means that the increase in peNDF does not seem to decrease ruminal acidosis.

36 Effects of proteolytic feed enzyme on intake, digestion, ruminal fermentation and milk production

Researchers

Eun, J.S.
Beauchemin, K.A.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Journal of Dairy Science. June 2005. Vol. 88, No. 6, p. 2140-2153.

The object of this research was to assess the effects of the addition of exogenous proteolytic enzyme (EPE) on intake, digestibility, ruminal fermentation and lactational performance of lactating dairy cows. Eight lactating Holstein cows were fed four different diets based on barley silage and alfalfa hay. The treatments consisted of diets with high forage only, high forage with EPE, low forage only and low forage with EPE. The digestibility of dry matter, organic matter, N, ADF and NDF increased with the addition of EPE in the diet. It also decreased the efficiency of utilization of N for milk production. As for cows fed the low forage diet, the addition of EPE increased the percentage of fat and lactose in milk, while it decreased the percentage of protein and it decreased the pH in the rumen as well. In the case of high-forage diets, milk lactose percentage increased. Overall, the addition of EPE contributes to improve nutrient digestibility but this positive effect is counteracted by the fact that the addition of EPE decreased feed intake by increasing ruminal acidosis.

37 Effects of Tween 80 and fibrolytic enzymes on ruminal fermentation and digestibility of feeds in Holstein cows

Researchers

Baah, J.
Shelford, J.A.
Hristov, A.N.
McAllister, T.A.
Cheng, K.J.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Asian-Australasian Journal of Animal Sciences. June 2005, Vol. 18, No. 6 p. 816-824.

The object of this study was to determine the effects on total tract digestion, in situ disappearance (ISD) and ruminal fermentation characteristics of orchard grass hay and barley grain of the non-ionic surfactant Tween 80 and of a mixture of fibrolytic enzymes. Four non-lactating Holstein cows were fed four different TMR containing rolled barley grain and orchard grass hay treated with water, Tween 80, hydrolytic enzymes and Tween 80 plus hydrolytic enzymes. The rate of ISD of orchard grass was faster when the cows were fed the enzyme alone or the enzyme plus Tween 80. As regards the barley grain, the addition of these supplements enhanced a slower rate of digestion than the one not treated. Greater concentrations of propionate and iso-valerate in the rumen and lower ratio acetate:propionate was observed when rations were treated with enzyme and Tween 80. The addition of enzyme in the diet also increased microbial protein synthesis whereas the flow of non-ammonia nitrogen to the duodenum increased with the addition of enzyme plus Tween 80. The authors concluded that the addition of fibrolytic enzymes alone or with Tween 80 could increase ISD of orchard grass hay just as it could increase concentrations of propionate, valerate, and iso-valerate in the rumen.

38 Lactation response of cows to different levels of ruminally inert conjugated linoleic acid under commercial conditions

Researchers

Gervais, R.
Spratt, R.
Leonard, M.
Chouinard, R.Y.

Canadian Journal of Animal Science. June 2005. Vol. 85, No. 2, p. 231-242.

The object of this study was to determine whether feeding calcium salts of CLA under commercial conditions would affect milk production, milk composition and blood metabolic profile. To perform this study, 240 dairy cows from eight farms were given four treatments varying in their CLA content (0, 8, 16 and 32 g d(-1)). Milk fat yield and milk fat concentration were decreased when cows were fed CLA, while MY, milk protein and blood metabolic parameters were not affected by the inclusion of CLA in the diet. It was concluded that calcium salts of CLA can be used to manage milk fat content on commercial dairy farms.

Main Canadian Institution

Université Laval

39 Potential protein degradation balance and total milk protein supply to dairy cows from heat-treated faba beans

Researchers

Yu, P.

Journal of the Science of Food and Agriculture. June 2005. Vol. 85, No. 8, p. 1268-1274.

The object of this study was to evaluate the effects of pressure toasting on potential protein nutritional value of faba beans with the NRC-2001 dairy model by determining undegraded (RUP) and degraded rumen protein (RDP), undegraded (RUST) and degraded rumen starch (RDST), truly absorbed undegraded protein (ARUP), microbial protein (MCPRDP) synthesized in the rumen from available protein in the rumen, truly absorbed rumen synthesized microbial protein (AMCP), truly absorbed rumen endogenous protein (AECP), total MP in the small intestine the protein degradation balance (PDB). RUP, RUST, ARUP and MP were increased by the treatments, while RDP, RDST, MCPRDP and PBD were decreased. It also increased the net absorbable total MP in the small intestine, while it decreased PDB. The results obtained indicated that potential microbial synthesis would not be impaired due to sufficient nitrogen in the rumen and that there were large potential losses of nitrogen in the rumen. The authors concluded that treatments improved the predicted potential protein degradation balance and total MP supply from faba beans.

Main Canadian Institution

University of Saskatchewan

Department of Animal and Poultry Science

40 Strong relationships between mediators of the acute phase response and fatty liver in dairy cows

Researchers

Ametaj, B.N.
Bradford, B.J.
Bobe, G.
Nafikov, R.A.
Lu, Y.
Young, J.W.
Beitz, D.C.

Canadian Journal of Animal Science. June 2005. Vol. 85, No. 2, p. 165-175.

This study aims to look at the relationship between activation of acute phase response and fatty liver in transition dairy cows. The authors induced fatty liver to dairy cows. The ones that developed a fatty liver reached a higher peak of total lipids in the liver than the control cows (at Day 12 after calving). Concentrations of total lipids in the liver at that time were positively correlated with the tumour necrosis factor-alpha, serum amyloid A and the NEFA in addition to being negatively correlated to plasma calcitonin gene-related peptide (CGRP) before calving. Concentrations of total lipids were also positively correlated with plasma serum amyloid A, haptoglobin and NEFA and negatively correlated with plasma prostaglandin E2, CGRP, total cholesterol and glucose. The authors also observed a negative relationship between concentrations of total lipids and concentrations of plasma glucose, lactate and total bilirubin after 12 days following calving. It was concluded that, in the case of cows with a fatty liver, the acute phase response occurs and there is a clear correlation between fatty liver and the mediators of immune response.

Main Canadian Institution

UNIVERSITY OF ALBERTA

41 A compartmental capillary, convolution integration model to investigate nutrient transport and metabolism in vivo from paired indicator/nutrient dilution curves

Researchers

Qiao, F.
Trout, D.R.
Quinton, V.M.
Cant, J.P.

Journal of Applied Physiology. September 2005. Vol. 99, No. 3, p. 788-798.

The object of this study was to assess nutrient transport and metabolism in vivo across the mammary gland of four cows from paired indicator/nutrient dilution curves of a compartmental capillary, convolution integration model. The authors injected para-aminohippuric acid (PAH) with glucose into the external iliac artery. The extracellular volume and kinetics of nutrient uptake was measured with different models of solute dispersion and disappearance. The Crone-Renkin models do not describe entire dilution curves and the Goresky models require two indicators to parametize extracellular behaviour. The authors then proposed the compartmental capillary, convolution integration model. It was concluded that after a rapid injection into the external iliac artery, more than 99% of the variation in the time course of venous PAH concentration was explained by partitioning the organ into a heterogeneous nonexchanging vessel subsystem and a well-mixed compartmental capillary subsystem.

Main Canadian Institution

UNIVERSITY of GUELPH

42 Kinetics of glucose transport and sequestration in lactating bovine mammary glands measured in vivo with a paired indicator/nutrient dilution technique

Researchers

Qiao, F.
Trout, D.R.
Xiao, C.
Cant, J.P.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Applied Physiology. September 2005. Vol. 99, No. 3, p. 799-806.

The purpose of this study was to quantify the kinetics of the glucose utilization by the mammary gland. The authors made bolus injections into the external iliac artery of bovine mammary glands and analyzed glucose and the extracellular indicator dilution curves obtained. Four submodels of glucose transport and metabolism in capillary supply zones were applied on the dilution curves of glucose and evaluated. The first model failed, suggesting that efflux of glucose from the intracellular space should be accounted for. The second model evaluated was over-defined and the third model was superior in its goodness-of-fit to curves as well as in the parameters' identifiability. Parameters of Michaelis-Menten of sequestration were not identifiable. It was also found that glucose sequestration followed first-order kinetics and the authors concluded to potential exchanges between an intracellular occlusion compartment and the extracellular glucose.

43 Effects of monensin and stage of lactation on variation of blood metabolites within 24 hours in dairy cows

Researchers

Plaizier, J.C.
Fairfield, A.M.
Azevedo, P.A.
Nikkhah, A.
Duffield, T.F.
Crow, G.H.
Bagg, R.
Dick, P.
McBride, B.W.

Main Canadian Institution

UNIVERSITY OF MANITOBA

Journal of Dairy Science. October 2005. Vol. 88, No. 10, p. 3595-602.

The purpose of this study was to evaluate the effects of prepartum administration of a monensin CRC and a lactation stage on the variations of blood metabolites within a period of 24 hours at three different stages of lactation; one week before calving, one week after calving and six weeks after calving. Sixteen dairy cows were fed TMR all they wanted, twice a day. It was found that serum concentrations of glucose, beta-hydroxybutyrate (BHBA), NEFA and urea varied significantly throughout the 24 hours period. Glucose, NEFA and urea were not affected by the administration of monensin but it reduced BHBA one week after calving. Concentrations of glucose were lower at week 1, while concentrations of BHBA and NEFA were higher. Urea concentration was higher six weeks after calving. The authors also observed that daily variations of BHBA and NEFA were not affected by monensin or by the stage of lactation. Daily variation of urea was affected only by the lactation stage.

44 Comparison of methods used to determine biomass on naturalized swards

Researchers

Martin, R.C.
Astatkie, T.
Cooper, J.M.
Fredeen, A.H.

Main Canadian Institution

Nova Scotia Agricultural College

Journal of Agronomy and Crop Science. 2005. Vol. 191, No. 2, p. 152-160.

The object of this study, carried out in 2000, was to compare visual estimate, sward height and rising plate metre (RPM) methods for determining forage biomass in mixed-species, naturalized, rotationally grazed dairy and beef pastures. Results obtained with the visual estimate method were not consistent, while the metre stick method was more effective in the dairy pasture. The RPM method was more effective in the beef pasture. It was also found that the accuracy of biomass estimation was greatly affected by the species composition and structural characteristics of the stand. It was concluded that there was no single method effective in all circumstances and that standard quadrat harvesting was still the most reliable method of estimating forage biomass in mixed species, naturalized pastures.

45 Effects of bovine somatotropin on beta-casein mRNA levels in mammary tissue of lactating cows

Researchers

Yang, J.
Zhao, B.
Baracos, V. E.
Kennelly, J. J.

Main Canadian Institution

UNIVERSITY OF ALBERTA

Journal of Dairy Science. American Dairy Science Association. Savoy, USA: 2005. Vol. 88, No. 8, p. 2806-2812.

Bovine somatotropin (bST) affects nutrient partition and maintenance of mammary cell functions, which increase milk production in lactating dairy cows. The purpose of this study was to verify the hypothesis that there is a positive relationship between bST treatment and of beta-casein mRNA in mammary tissues of lactating cows. The authors found that beta-casein mRNA was higher in mammary tissues of cows treated with bST and that this was caused by the stimulation from prolactin and bST. The increase in beta-casein mRNA also depended on milking intervals. It was concluded that bST could play a role in up-regulating or sparing beta-casein mRNA levels in mammary tissues, just as does for prolactin.

46 Effects of corn silage particle length and forage: Concentrate ratio on milk fatty acid composition in dairy cows fed supplemental flaxseed

Researchers

Soita, H.W.
Fehr, M.
Christensen, D.A.
Mutsvangwa, T.

Main Canadian Institution

University of Saskatchewan

Department of Animal and Poultry Science

Journal of Dairy Science. 2005. Vol. 88, No. 8, p. 2813-2819.

The authors' hypothesis is that a decrease in forage particle length and forage concentrate ratio would lead to an increase in unsaturated fatty acids (FA) flow to the small intestine and a subsequent transfer of these unsaturated fatty acids into milk. They carried out an experiment to determine the effects of the chop length for corn silage and forage, to concentrate ratio (F: C) on performance and milk FA profiles in dairy cows supplemented with flaxseed. Eight Holstein cows were fed twice a day TMR with two different dietary factors; F:C ratios of 55:45 and 45:55 and two different corn silage particle lengths. Feeding short cut corn silage resulted in a depressed milk protein yield and, at high F:C ratio, depressed milk fat proportion of C16:0. Short cut corn silage with high F: C ratio also increased the proportion of C18:1 cis-9 and C:18:2 cis-9, trans-11 in milk fat. Significant interactions between particle size and F:C ratio were also observed for milk fat proportions of C16:0, C18:1 cis-9 and C18:2 cis-9, trans-11 (a CLA isomer). It was concluded that milk fatty acids profiles in dairy cows fed supplemental flaxseed as a source of polyunsaturated fatty acids were influenced by the corn silage particle length and the F: C ratio.

47 Effects of dietary supplements of folic acid and rumen-protected methionine on lactational performance and folate metabolism of dairy cows

Researchers

Girard, C.L.
Lapierre, H.
Matte, J.J.
Lobley, G.E.

Journal of Dairy Science. 2005. Vol. 88, No. 2, p. 660-670.

The purpose of this study was to evaluate the interactions between dietary supplements of folic acid and rumen-protected methionine on lactational performance and on indicators of folate metabolism during one lactation. Fifty-four multiparous Holstein cows were fed a diet calculated to supply methionine as 1.75% metabolizable protein, equivalent to 70% of methionine requirement, half of them received also a rumen-protected methionine supplement. Within each diet, the cows received no folic acid or two different doses of the vitamin. Rumen-protected methionine increased milk total solid concentration but not yield. Supplementary folic acid increased crude protein and casein concentrations in milk of cows fed no supplementary methionine and the effect increased as lactation progressed; it also decreased milk lactose concentration. Folic acid supplements had the opposite effects on milk crude protein, casein and lactose concentrations in cows fed rumen-protected methionine. Milk and milk component yields and dry matter intake were unchanged. The highest concentrations of serum folates and cysteine, the lowest serum concentrations of vitamin B_{12} and methionine and the slowest serum clearance of folates were observed during the first two months of lactation. These findings strongly suggest that the vitamin B_{12} supply was inadequate and interfered with folate use. It could explain the limited lactational response to supplementary folic acid observed in the present experiment.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

The summary was provided by Dr. Christiane L. Girard.

48 Effects of inoculation of high dry matter alfalfa silage on ensiling characteristics, ruminal nutrient degradability and dairy cow performance

Researchers

Rizk, C.
Mustafa, A.F.
Phillip, L.E.

Main Canadian Institution

McGill

Journal of the Science of Food and Agriculture. 2005. Vol . 85, No. 5, p. 743-750.

The purpose of this study was to determine the effects of a homolactic acid inoculant on ensiling characteristics and nutritive value of high dry matter alfalfa. The authors determined the ensiling characteristics by ensiling inoculated and untreated alfalfa haylage and used two lactating cows to determine ruminal degradabilities of nutrients. Inoculated alfalfa silage showed a lower pH, higher concentration of lactic acid and lower concentration of water-soluble carbohydrates than untreated alfalfa silage. Proteolysis was increased by the inoculation, while ruminal degradability of dry matter, crude protein, NDF, dry matter intake and MY were similar with both treatments. The authors concluded that the inoculant used for the purpose of this study improved the ensiling characteristics of alfalfa silage without having significant effects on dairy cow performance.

49 Effects of stage of lactation on protein metabolism in dairy cows

Researchers

Lapierre, H.
Girard, C.L.
Matte, J.J.
Lobley, G.E.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Journal of Animal and Feed Sciences. 2005. Vol. 14, No. 1, p. 53-62.

This study aims to assess the interaction between folic acid and a supplementation of methionine in the diet on protein metabolism at six and 25 weeks during lactation. Forty-two lactating dairy cows were fed two levels of methionine and three levels of folic acid. There was no effect of treatments on protein metabolism that was, however, affected by the stage of lactation. Despite the fact that milk production and protein yield were higher in early lactation (6 weeks) than in late lactation (25 weeks), whole body protein synthesis was not affected by the stage of lactation. However, the partition of this synthesis was altered, with a greater proportion of protein synthesis directed towards milk output in early lactation. This study confirms the high turnover rate of protein in dairy cows with a total amount of protein synthesized averaging 4.14 and 4.08 kg/d, but 1.43 and 1.22 kg excreted as milk protein at six or 25 weeks of lactation.

50 Effects of the forage-to-concentrate ratio on B-vitamin concentrations in different ruminal fractions of dairy cows

Researchers

Santschi, D.E.
Chiquette, J.
Berthiaume, R.
Martineau, R.
Matte, J.J.
Mustafa, A.F.
Girard, C.L.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Canadian Journal of Animal Science. 2005. Vol. 85, p. 389-399.

Ruminal fluid was collected from dairy cows using three methods: 1) a stomach tube directly through the ruminal cannula; 2) a syringe screwed to a stainless tube covered by a fine metal mesh; or 3) a rubber tube connected to a vacuum pump. Fluid samples were either acidified to disrupt bacterial membranes or centrifuged to remove the bacterial fraction. B-vitamin concentrations were higher in the acidified than in the centrifuged fluid, while the collection method had only a limited effect. Results of this study strongly suggest that B-vitamin concentration in ruminal fluid is not a good indicator of their synthesis and that the bacterial fractions should probably be considered.

This summary was provided by Dr. Christiane L. Girard.

51 Effects of the methods of collection and sample preparation on the concentrations of B-vitamin in ruminal fluid of dairy cows

Researchers

Santschi, D.E.
Chiquette, J.
Berthiaume, R.
Matte, J.J.
Mustafa, A.F.
Girard, C.L.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Canadian Journal of Animal Science. 2005. Vol. 85, p. 417-420.

Two studies were undertaken to verify the effect of the forage-to-concentrate ratio of the diet on B-vitamin concentrations in ruminal contents. In Study 1, eight primiparous and eight multiparous cows were used in a cross-over design and concentrations of biotin, folates and vitamin B_{12} were determined in ruminal fluid and plasma of cows fed a high-forage (HF; 58:42 forage-to-concentrate ratio; DM basis) or a low-forage (LF; 37:63 forage-to-concentrate ratio; DM basis) diets. In Study 2, 6 ruminally cannulated lactating cows were used in a cross-over design to evaluate the effects of forage-to-concentrate ratio (HF = 60:40; LF = 40:60; DM basis) on concentrations of seven B-vitamins in the particle-free fluid and in both liquid- and solid-associated bacteria. Results showed that B-vitamins were present mainly in the bacterial fractions of the ruminal content, while only limited amounts were found in the surrounding fluid. A change in the forage-to-concentrate ratio had a greater effect on vitamin concentration in the bacteria associated to the solid fraction than in those present in the liquid portion of the rumen. The most noticeable effects of a low forage diet were an increase in riboflavin but a decrease in true vitamin B_{12} concentrations in solid-associated bacteria as well as a decrease in biotin concentration in particle-free fluid. In conclusion, it appears that ruminal B-vitamin concentration is altered by changes in the forage-to-concentrate ratio, which suggests that the supply of vitamins to dairy cows is influenced by diet composition.

52 Fate of supplementary B-vitamins in the gastrointestinal tract of dairy cows

Researchers

Santschi, D.E.
Berthiaume, R.
Matte, J.J.
Mustafa, A.F.
Girard, C.L.

Journal of Dairy Science. 2005. Vol. 88, No. 6, p. 2043-2054.

The object of this study was to assess the disappearance of supplementary B-vitamins before and from the small intestine. Two studies were carried out using four lactating Holstein cows. In study 1, vitamins were added to the feed whereas in study 2, vitamins were infused postruminally. Dietary supplemented B-vitamins are extensively destroyed before reaching the small intestine. Most of this disappearance occurred in the rumen, except for niacin and folic acid. A considerable proportion of folic acid seemed to be absorbed in the proximal duodenum, whereas it appears that niacin is converted to other forms or absorbed before the small intestine. Except for riboflavin and niacin, absolute amounts disappearing from the small intestine were greater during the treatment than the control periods, suggesting that B-vitamin supply in dairy cows is increased by supplementation, although losses in the rumen are extensive.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

This summary was provided by Dr. Christiane L. Girard.

53 The route of absorbed nitrogen into milk protein

British Society of Animal Science. 2005. Vol. 80, No. 1, p. 11-22.

Researchers

Lapierre, H.
Berthiaume, R.
Raggio, G.
Thivierge, M.C.
Doepel, L.
Pacheco, D.
Dubreuil, P.
Lobley, G.E.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

In order to review the metabolism of N compounds from absorption to milk, 14 studies were examined that measured the net flux of nitrogenous compounds across the gut and the liver in dairy cows. The apparent N digested averaged 0.65 of intake of which 0.34 was excreted in urine and 0.31 secreted as milk. The N absorbed into the portal vein is mostly absorbed in the form of free AA and ammonia. All of the absorbed ammonia is removed and detoxified by the liver. Detoxification of ammonia by the liver and catabolism of AA result in production of urea as an end-product. Approximately only half of this urea will be excreted in urine, as an important salvage mechanism exists in ruminants and an important part of the urea produced by the liver is recycled from the blood circulation into the lumen of the gut as a source of N for microbial protein synthesis. The efficiency of transfer of absorbed AA into milk protein decreases with increasing supply of protein. This loss of efficiency is linked directly with increased hepatic removal for some AA (histidine, methionine, phenylalanine) and, probably, increased catabolism by peripheral tissues, including the mammary gland, for other amino acids like the branched-chain amino acids and lysine. Therefore, we must stop using fixed factors of conversion (CNV) of digestible AA to milk in our predictive schemes and acknowledge that metabolism of AA between delivery from the duodenum and CNV to milk protein will vary with nutrient supply.

This article was provided by Dr. Hélène Lapierre.

Genetics

1 Analysis of the relationship between type traits and functional survival in Canadian Holsteins using a Weibull proportional hazards model

Researchers

Sewalem, A.
Kistemaker, G.J.
Miglior, F.
Van Doormaal, B.J.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

Journal of Dairy Science. 2004. Vol. 87, No. 11, p. 3938-3946.

The purpose of this study was to evaluate the impact of type traits on the functional survival of Canadian Holstein cows using a Weibull proportional hazards model. Survival was defined as the number of days from first calving to culling, death, or censoring of Canadian Holstein cows. Data from more than 1 million cows were used in this study. The data recorded consisted of phenotypic scores for eight composite traits and 23 linear traits. The statistical model included the effects of stage of lactation, production season, annual change in herd size, type of milk recording supervision, age at first calving, effects of milk, fat and protein yields, each type trait, and the sire. Among the composite traits' final score, mammary system and the feet and legs had a strong relationship with functional survival. Higher risks of culling were observed for cows that had low scores for these traits. Udder attachment, udder texture, udder depth, rear udder attachment height and rear udder attachment width were the linear traits that had a strong relationship with functional survival.
This summary was provided by Dr. Asheber Sewalem.

2 Development of an optimal index to improve lactation yield and persistency with the least selection intensity

Researchers

Togashi, K.
Lin, C.Y.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

Journal of Dairy Science. 2004. Vol. 87, No. 9, p. 3047-3052.

The improvement of both lactation milk yield (MY) and persistency is essential. Many restrictions on selection criteria designed to improve both MY and persistency of lactation at the same time are required to modify the lactation curve. That means manipulation of the lactation curve to improve persistency requires a higher selection intensity than the unrestricted selection based on 305 days of estimated breeding value (EBV). This research showed that it is possible to derive different indexes to achieve this selection constraint using different degrees of selection intensity. It was found preferable to choose the index that requires the least selection intensity from the class of indexes that meets the same restriction. The reason for that is that it is easier to achieve the selection goal with a lower selection index. Nevertheless, in order to achieve the genetic gains wanted using the lowest selection intensity, an optimal index based on random regression (RR) coefficients was developed. Examples are presented to demonstrate the procedures developed in comparison with conventional selection based on a 305 days of EBV.

3 Genetic relationships between persistency and reproductive performance in first-lactation Canadian Holsteins

Researchers

Muir, B.L.
Fatehi, J.
Schaeffer, L.R.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Dairy Science. 2004. Vol. 87, No. 9, p. 3029-3037.

In this research, the genetic relationships between the lactation persistency and the reproductive performance in first lactation as well as the relationships with days in milk at the peak milk yield (MY) and the estimated 305 days MY were studied. To conduct this study, data were collected on first-parity reproduction, persistency and production from 33-312 first lactation Canadian Holsteins. It was found that heritability for persistency, days in milk at peak MY, and estimated 305-days MY were 0.18, 0.009 and 0.45 respectively, while heritability for reproduction were quite low. The age at first insemination showed the higher heritability. Heifers' reproductive traits were less genetically correlated, while cows' reproductive traits were moderately correlated. At insemination, heifers younger than average and/or conceived successfully at first insemination generally had a more persistent first lactation. The persistency of the heifers for the first lactation was also increased with difficulty at calving, successful conception at first insemination and longer interval between first and second calving. It was also found that the estimated genetic correlations of the reproductive performance (estimated 305-days MY) were different in magnitude but similar in sign compared to those for persistency.

4 Genetics of locomotion

Researchers

Van Dorp, T.E.
Boettcher, P.
Shaeffer, L.R.

Main Canadian Institution

UNIVERSITY of GUELPH

Livestock Production Science. 2004. Vol. 90, No. 2-3, p. 247-253.

The purpose of this research was to evaluate the heritability of the locomotion score as well as the genetic and phenotypic correlations of the locomotion score with milk production (150 days in milk), the body condition score and selected conformation traits. To achieve this, data were collected from 3,298 cows in 1997. It was found that the locomotion heritability was low just like the phenotypic correlation of the locomotion score with the milk production and conformation traits. Moderate negative correlations were found between the body condition score and milk production. A genetically better locomotion was observed for cows having both a high body condition score and a high milk production. Moderate, but favourable, genetic correlations were found between the udder traits and the locomotion. The feet and legs, foot angle and rear leg set were highly genetically correlated to locomotion score. Cows with a higher feet and legs score, steeper foot angle and straighter legs had a genetically better locomotion. A more favourable locomotion was also observed for cows with higher rear udder attachments, longer front udder attachments and an increased udder quality.

5 Genetic susceptibility to *Neospora caninum* infection in Holstein cattle in Ontario

Researchers

Pan, Y.
Jansen, G.B.
Duffield, T.F.
Hietala, S.
Kelton, D.
Lin, C.Y.
Peregrine, A.S.

Main Canadian Institution

Journal of Dairy Science. 2004. Vol. 87, No. 11, p. 3967-3975.

The endemic foetal loss and the occasional abortion epidemics in cattle around the world are often caused by *Neospora caninum* (NC). The purpose of this study was to examine the sera for antibodies to NC coming from nearly 10,000 cows from 125 herds of Ontario. It was found that the overall prevalence of the NC antibodies was 11.2%, while the prevalence for each herd varied between 0% and 70.4%. A rate of detected vertical transmission of 40.7% was observed. The authors arranged five genetic models with fixed effects of bleeding year-month, age of the animals and herd against the data. These five models were the sire model, the animal model, the sire-dam model, a sire-maternal grandsire model and a maternal effects model. It was found that an estimated heritability of susceptibility to NC ranged from 0.084 to 0.124. A closer fit was observed between the sire-maternal grandsire model and the maternal effects model. It was concluded that greater importance should be given to management practices than to the genetic selection so as to reduce the incidence of the NC infection.

6 Identification of a mutation associated with factor XI deficiency Holstein cattle

Researchers

Marron, B.M.
Robinson, J.L.
Gentry, P.A.
Beever, J.E.

Main Canadian Institution

Animal genetics. 2004. Vol. 35, No. 6, p. 454-456.

An autosomal recessive deficiency with the blood coagulation factor XI (FXI) has been described in Holstein cattle. However, accurate identification of the disease carriers (heterozygotes) is not an easy task as current testing methods are not suitable for it. A polymerase chain reaction (PCR)-based strategy was achieved in this research to clone and sequence the bovine FXI gene (F11) from animals of different genotypes in order to identify the molecular basis of this deficiency. The sequences derived from homozygous normal and deficient animals were compared. The comparison showed that the FXI deficiency in Holsteins is related with the insertion of a 76 bp segment within exon 12. This introduces a stop codon resulting in a mature FXI protein that lacks the functional protease domain encoded by exons 13, 14 and 15. These results allowed the development of a DNA-based diagnostic test for accurate genotyping. This method revealed that the frequency of the mutated allele was 1.2% in a contemporary population of the USA Holstein sires.

7 Estimates of genetic parameters for Canadian Holstein female reproduction traits

Researchers

Jamrozik, J.
Fatehi, J.
Kistemaker, G.J.
Schaeffer, L.R.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Dairy Science. 2005. Vol. 88, No. 6, p. 2199-2208.

This study aimed to analyze, through a linear multiple-trait model, the genetic parameters for Canadian Holstein female reproduction traits. The traits analyzed included age at first insemination, number of services, first-service non-return rate to 56 days, days from service to conception, calving ease, stillbirth, gestation length and calf size. These traits covered a wide spectrum of aspects related to the reproductive performance of dairy cows. Data from more than 50,000 cows from Ontario and Quebec were collected for this study. It was found that heritability for fertility traits were quite low, ranging from 3% to 13%. The variation sources for the non-return rate and traits related to calving performance that were found to be important were: the service sire, the sire of calf and the artificial insemination technician. The genetic correlations for fertility traits in heifers and older cows were also very low. These results indicated that different traits measured different aspects of a dairy cow's reproductive performance and that these traits could be used jointly in a fertility index. This would allow for better selecting the fertility aspect of dairy cattle.

8 Genetic analysis of herd life in Canadian dairy cattle on a lactation basis using a Weibull proportional hazards model

Researchers

Sewalem, A.
Kistemaker, G.J.
Ducrocq, V.
Van Doormaal, B.J.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

Journal of Dairy Science. 2005. Vol. 88, No. 1, p. 368-375.

This research aimed to identify the most important factors that influence the functional survival and to assess the genetic parameters of the functional survival for Canadian dairy cattle, using a Weibull proportional hazards model. Data were obtained from lactation records extracted for the May 2002 genetic evaluation of Holstein, Jersey and Ayrshire breeds that calved between July 1, 1985 and April 5, 2002. The statistical model included the effects of stage of lactation, season of production, the annual change in herd size, type of milk recording supervision, age at first calving, effects of milk, fat and protein yields calculated within herd-year-parity deviations and the random effects of herd-year-season of calving and sire. All effects fitted in the model were found to have an effect on the functional survival, with MY being the most important factor influencing survival. The functional survival hazard increased as milk production decreased and as fat content increased. The risk of culling was also increased for heifers that were older at calving and in unsupervised herds. The expanding herds were also at a lower risk of culling than the stable herds. The heritability values were found to be 0.14 for Holstein cows, 0.09 for Jersey cows, and 0.10 for Ayrshire cows. The authors concluded that the estimated genetic trend obtained using the survival kit was overestimated.

This summary was provided by Dr. Asheber Sewalem.

9 Genetic evaluation strategies for multiple traits and countries

Researchers

Sullivan, P.G.
Wilton, J.W.
Shaeffer, L.R.
Jansen, G.J.
Robinson, J.A.B.
Allen, O.B.

Main Canadian Institution

UNIVERSITY of GUELPH

Livestock Production Science. 2005. Vol. 92, No. 3, p. 195-205.

The purpose of this research was to study genetic evaluations strategies. To that end, simulated data for three lactation traits in two importing and two exporting countries running a typical progeny test program were used. The three strategies considered for the purpose of this study were conversion (CNV), multiple-trait across-country evaluation (MACE) and global animal model (GAM). It was observed that the base populations were either unselected, that all the mates were above average and the exporting countries had higher genetic means than importing countries. The prediction errors for the top bulls with the unselected base populations, were higher using CNV, while they were lower with all bulls, using GAM. The MACE strategy showed lower prediction errors than the GAM strategy for the top bulls whereas both showed slightly lower prediction errors with all bulls. The prediction errors were also lower using the strategy evaluating the multiple traits per country as compared to the strategy evaluating one single trait per country. However, evaluations were biased. All strategies using either selected or unselected base populations favoured bulls from importing countries on the foreign scales of evaluation. It was also found that the true merits of the top bulls selected using MACE or GAM were similar and higher than using CNV.

10 Joint international evaluation of milking shorthorn dairy cattle for production traits

Researchers

Barrett, R.
Miglior, F.
Jansen, G.
Jamrozik, J.
Schaeffer, L.R.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

Journal of Dairy Science. 2005. Vol. 88, No. 9, p. 3326-3336.

This study aimed to analyze the pedigree information and test-day records for the first three parities of milking Shorthorn dairy cattle from five countries. Information from about 69,000 cows was collected and variance components for both single and multiple countries were estimated. Fixed and random effects were evaluated. Fixed effects included herd test-day class and regressions on days in milk within age at calving-parity-season of calving, while random effects included animal genetic, permanent environmental and residual effects. It was found that the average daily heritability from single country analyses ranged from 0.33 to 0.47 for milk and from 0.37 to 0.45 in the case of protein yield across lactations and countries. Genetic correlations between countries were quite low but correlations among country EBV for milk were higher. It was concluded that international comparison of milking Shorthorns could be facilitated by the future evaluation with increased genetic ties among countries.

11 Maximization of lactation milk production without decreasing persistency

Researchers

Lin, C.Y.

Togashi, K.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

Journal of Dairy Science: 2005. Vol. 88, p. 2975-2980.

Six selection strategies for improving lactation milk without decreasing persistency were compared: 1) index IR1, subject to the restriction of equal genetic gains at DIM 60 and 280, 2) IR2, subject to the restriction of zero gain at DIM 60, 3) desired gains index Id, designed to increase lactation milk without altering the lactation curve, 4) index Iu, comprising lactation EBV and persistency without standardization, 5) index Iw, consisting of lactation EBV and persistency with standardization, and 6) conventional selection on lactation EBV (EBVL). Of the six selection strategies compared, IR2 yielded the greatest persistency, but achieved the smallest response in lactation EBV, suggesting that it is impractical to increase persistency by inhibiting the peak yield. Index Iu showed the same response in lactation milk as conventional selection on EBVL, but resulted in decreased persistency. Although both IR1 and Id achieved constant persistency, the former produced a greater lactation response than the latter. Thus, IR1 is a viable strategy for improving EBVL, while holding persistency constant. None of the six selection strategies excelled in both lactation milk and persistency. Index Iw appears to be a reasonable choice for improving both traits, although responses would depend on the relative importance of the two traits. The procedure developed provides a useful means of modifying the lactation curve by restricting differential genetic gains among different days of the lactation.

This summary was provided by Dr. Ching Y. Lin.

12 Potential and limitations of bovine-specific arrays for the analysis of mRNA levels in early development: Preliminary analysis using a bovine embryonic array

Researchers

Sirard, M.A.
Dufort, I.
Vallée, M.
Massicotte, L.
Gravel, C.
Reghenas, H.
Watson, A.J.
King, W.A.
Robert, C.

Main Canadian Institution

UNIVERSITÉ LAVAL

Reproduction and Fertility Development. 2005. Vol. 17, No. 2, p. 47-57.

The measurement of differential mRNA concentrations in oocytes and pre-implanted embryos has lead to the availability of new insights into the early development of large mammals. It is now feasible to amplify starting material and making measurements in single embryo units. It is therefore possible to evaluate the variations in the gene expression patterns during the pre-implantation period or the impact of the culture on mRNA concentrations. Nevertheless, there are limitations associated with these methods, such as sample preparation or the use of appropriate controls. Even proper analysis is crucial to achieve the full benefit of using these tools. This article aims to describe the potential and the limitations of the mRNA analysis in early embryos, especially for microarray analysis. The authors have generated a bovine cDNA array, which contained expressed sequence tags (EST). These were collected from various pre-implantation development stages. From the immature oocyte to the blastocyst stage, they have then initiated the characterization of the global mRNA patterns for several key development stages. When the oocyte and blastocyst samples were compared to a reference mRNA sample made from a pool of EST from pooled somatic tissues, quite different expression profiles were found, involving hundreds of genes. It was concluded that this technique was useful in discovering candidate genes that may be fairly important during the early embryonic life. However, this array still is in its preliminary stage. The EST bank will have to be processed to contain only unigenes but the technique can already be used.

13 Relationship between type traits and longevity in Canadian Jerseys and Ayrshires using a Weibull proportional hazards model

Researchers

Journal of Dairy Science. 2005. Vol. 88, No. 4, p. 1552-1560.

Sewalem, A.
Kistemaker, G.J.
Van Doormaal, B.J.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

The object of this study was to examine the impact of type traits on the functional survival of Canadian Jersey and Ayrshire cows using a Weibull proportional hazards model. Survival was defined as the number of days from the first calving to culling, death or censoring. The authors collected data from nearly 50,000 Jersey cows and 77,000 Ayrshires. The data recorded consisted in phenotypic scores for 8 composite traits and 19 linear descriptive traits. For Jersey cows, among the composite type traits with the greatest contribution to the likelihood function was final score followed by mammary system. In the case of Ayrshire cows, the most important trait was feet and legs followed by the final score. It was also found that cows classified as Poor for final score had five times more probability of being culled than Good Plus cows. Furthermore, cows classified as Poor for feet and legs had also five times more probability of being culled than cows classified as Excellent. Finally, Excellent cows had nine times more chances to survive than cows classified as Poor.

This summary was provided by Dr. Asheber Sewalem.

14 RNA interferences as a tool to study gene function in bovine oocytes

Researchers

Paradis, F.
Vigneault, C.
Robert, C.
Sirard, M.A.

Molecular Reproduction and Development. 2005. Vol. 70, No. 2, p. 111-121.

The purpose of this study was to examine the gene function in bovine oocytes using an RNAi approach. Two experiments were performed. In the first, three different treatments were tested to improve the oocytes survival following microinjection. The treatments consisted in a 20-minutes exposure to cytochalasin B, a 6-hours maturation in cycolheximide and a combination of both. The survival rate of microinjected oocytes was increased with the cycloheximide/cytochalasin B treatment. The second experiment aimed to assess the effect of both cyclin B1 and green fluorescent protein (GFP) dsRNA on cyclin B1 mRNA and protein expression. A decrease in cyclin B1 mRNA and protein followed the injection of B1 dsRNA. No interferences were observed between the injection of GFP dsRNA and cyclin B1 mRNA, protein, or with the ability of the oocytes to mature properly. Ten percent of the oocytes were activated by the lack of cyclin B1 in the oocyte. Germinal vesicle breakdown was prevented by the use of an additional 10-hours maturation in the presence of 6-dimethylaminopurine. This additional maturation time also allowed a longer exposure to dsRNA. It increased the percentage in activated oocytes to 33%, which was likely caused by an increased length of time for dsRNA processing and for a degradation of the cyclin B1 mRNA to occur. It was concluded that the RNAi technique was useful to study the gene function in the bovine oocyte.

Main Canadian Institution

UNIVERSITÉ LAVAL

15 Selection indices in Holstein cattle of various countries

Researchers

Miglior, F.
Muir, B.L.
Van Doormaal, B.J.

Journal of Dairy Science. 2005. Vol. 88, No. 3, p. 1255-1263.

A brief description of the national selection index and of the top bulls listings since August 2003 was provided by various countries based on geographical representation, Interbull membership and the size of the progeny testing programs. The authors compared the relative emphasis on production, durability, health, and reproduction, along with the number of common bulls among the top listings between countries. The main difference found between the selection indices was the relative emphasis on production. The better balanced emphasis across production, durability, health and reproduction was found to be in the Danish S-index. Similarities between the top bull listings among various countries were observed to decrease. That is due to the broadening of breeding goals achieved through the recent changes brought to the selection indices.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

16 Simultaneous procedure for deriving selection indexes with multiple restrictions

Researchers

Lin, C.Y.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

Journal of Animal Science. 2005. Vol. 83, No. 3, p. 531-536.

This study aims to present the theory and methods of a simultaneous procedure used for constructing indexes with single or multiple restrictions, since formulas given in the literature were designed for the imposition of a single restriction only. Examples are given here to verify the theoretical development and to demonstrate the proper functioning of the procedure. The construction of various restrictive indexes into a simple computational scheme is involved in the simultaneous procedure. This scheme can be useful to handle multiple traits, to modify the growth curve of meat animals or the lactation curve of dairy animals. When the index is a restricted one, the variance of an index (b'Pb) is not equal to the covariance between an index and its net merit (b'Ga). However, this research showed that the growth curve of meat animals or the lactation curve are generally equal in both restricted and unrestricted cases, only when the b elements represent the original solutions from the index equations. When the b elements are expressed as proportions, they are not equal.

Health

1 Effects of water source, dilution, storage and bacterial and faecal loads on the efficacy of electrolyzed oxidizing water for the control of *Escherichia coli*

Researchers

Journal of Food Protection. July 2004. Vol. 67, No. 7, p. 1377-1383.

Stevenson, S.M.L.
Cook, S.R.
Bach, S.J.
McAllister, T.A.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

The object of this study was to assess the potential of using electrolyzed oxidizing (EO) water for controlling *Escherichia coli* O157:H7 in water for livestock. To that end, the effects of water source, electrolyte concentration, dilution, storage conditions, and bacterial or faecal load on the oxidative reduction potential (ORP) and bactericidal activity of EO water were investigated. It was found that anode and combined EO water decreased the pH and increased the ORP of deionized water, while cathode-EO water had adverse effects. The ORP values of all water types were also reduced by the addition of faeces into EO water products and a relationship was found between ORP and bactericidal activity of EO water. The authors concluded that EO water may be an effective tool to control *E. coli* O157:H7 in livestock water with a low content of organic matter.

2 Molecular typing and distribution of *Staphylococcus aureus* isolates in eastern Canadian dairy heifers

Researchers

Sabour, P.M.
Gill, J.J.
Lepp, D.
Pacan, J.C.
Ahmed, R.
Dingwell, R.
Leslie, K.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Clinical Microbiology, August 2004, Vol. 42, No. 8, p. 3449-3455.

The aim of this study was to typify and assess the genetic relationships between 288 *Staphylococcus aureus* isolates with the use of macrorestriction analysis of SmaI-digested chromosomal DNA using pulsed field gel electrophoresis (PFGE). These isolates were collected from 58 eastern Canadian dairy herds and a subset of them was further evaluated for sensitivity against 10 antimicrobial compounds. Twenty-nine distinct PFGE types were identified and grouped according to estimates of genetic relationships. Six groups of isolates were formed and designated A through F. Groups A, D and F regrouped 93% of the isolates. Only a single type of PFGE was found in more than half of the herds. Antimicrobial resistance evaluation showed that 24.5% of the 212 isolates evaluated were resistant to one or more antimicrobials with resistance to penicillin being the most common encountered, followed by resistance to sulfadimethoxine. The major portion of the isolates responded to phages from groups 1 and 3, while the others could not be typified and few of them belonged to a variety of phages types. Groups A and F of isolates contained most of the PFGE lineage groups corresponding to groups 3 and 1 respectively, while most isolates assigned to group D could not be typified. It was found that the discriminatory power of PFGE typifying was greater than phage typifying to define the relatedness of the *S. aureus* isolates.

3 Immune responses to a DNA/protein vaccination strategy against *Staphylococcus aureus*-induced mastitis in dairy cows

Researchers

Shkreta, L.
Talbot, B.G.
Diarra, M.S.
Lacasse, P.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Vaccine. November 2004. Vol. 23, No. 1, p. 114-126.

The fibronectin binding protein (FnBP) and clumping factor A (ClfA) of *Staphylococcus aureus* were the targets of a DNA and protein vaccination against *S. aureus* mastitis in dairy cows. To conduct the study, the authors vaccinated four seven-month pregnant heifers with a DNA vaccine containing the bicistronic plasmid (pCI-D1D3-IRES-ClfA) as well as the plasmid encoding the bovine granulocyte-macrophage-colony stimulatory factor gene (pCI-bGM-CSF). Four others were used as controls. These heifers were immunized twice with this vaccine and were also boosted once with recombinant D1D3 and ClfA proteins, while four other heifers were not immunized. Three weeks after calving, three mammary quarters of each vaccinated and non-vaccinated cow were challenged with *S. aureus*. During the 24 to 72 hours period post-challenge, immunized cows showed lower serum haptoglobin levels, cardiac rhythm and body temperature. At 21 days of post-challenge, bacteria were detected in five quarters of the vaccinated cows compared to 11 of the control quarters. The authors concluded that DNA-protein vaccination against FnBP and ClfA of *S. aureus* caused both lymphoproliferative and humoral immune responses that protected partially the mammary gland from staphylococcal mastitis and provided better post-challenge conditions in vaccinated cows.

4 Impacts of early lactation somatic cell count in heifers on somatic cell counts over the first lactation

Researchers

de Vliegher, S.
Barkema, H.W.
Stryhn, H.
Opsomer, G.
de Kruif, A.

Main Canadian Institution

Journal of Dairy Science. November 2004. Vol. 87, No. 11, p. 3672-3682.

The purpose of this study was to assess the impact of somatic cell count in early lactation (SCCel) on test-day somatic cell count (SCC) in the first lactation of Belgian dairy heifers. The extent of that increase depends on the moment when these measures were taken. The negative effect of an elevated SCCel on test-day SCC was still present if SCC was below 50,000 cells per mL at the second test-day, although to a lesser extent. It was concluded that elevated SCC in early lactation had negative effects on test-day SCC during all of the first lactation.

5 Prevalence of paratuberculosis in culled dairy cows in Atlantic Canada and Maine

Researchers

McKenna, S.L.B.
Keefe, G.P.
Barkema, H.W.
McClure, J.
Van Leeuwen, J.A.
Hanna, P.
Sockett, D.C.

Main Canadian Institution

Journal of Dairy Science. November 2004. Vol. 87, No. 11, p. 3770-3777.

A systematic random sample of slaughterhouse cattle in Eastern Canada and Maine was made to determine the prevalence of ileum infection with *Mycobacterium avium* subsp. paratuberculosis (Mptb). The prevalence of infection with Mptb was estimated at 16.1%. Both histological and bacteriological methods were used to evaluate mesenteric lymph nodes and ileum of 984 cows and it was found that histological testing was far less sensitive for detecting infected cattle than the bacteriological method. Finally, a higher proportion of cows tested Mptb-positive was observed in June.

6 Certification of herds as free of *Mycobacterium* paratuberculosis infection: actual pooled faecal results versus certification model predictions

Researchers

Kalis, C.H.J.
Collins, M.T.
Barkema, H.W.
Hesselink, J.W.

Main Canadian Institution

Preventive Veterinary Medicine. 2004. Vol. 65, No. 3-4, p. 189-204.

This research on herd certification was performed with 100 Dutch dairy herds free of clinical signs of Johne's Disease (JD) for at least three years. After some preliminary tests, 10 herds dropped out of the study for reasons other than paratuberculosis diagnosis. Sixty-one percent of the herds left were diagnosed Mptb-infected and the number of infected herds decreased as the number of testing increased. Observed and predicted percentages of truly non-infected (JD-free) herds were compared. It was found that the two models were significantly different. However, when the within-herd infection prevalence for infected but test-negative herds after each round of serial testing was changed and a diagnostic sensitivity of 40%-50% selected, results observed and predicted were close to each other. It was concluded that for JD certification programs, culture of pooled faecal samples has a high sensitivity and specificity a low cost.

7 Development of *Pichia pastoris* as a rumen escape vehicle for the intestinal delivery of recombinant proteins in ruminants

Researchers

Strauss, C. E.
McAllister, T. A.
Selinger, L. B.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

Canadian Journal of Animal Science. 2004. Vol. 84, No. 4, p. 611-619.

The object of this study was to investigate the efficiency of cellular encapsulation as a method of delivering bioactive proteins and limiting amino acids (AA) to the small intestine of ruminants. In order to assess the cellular integrity of *Pichia pastoris* and evaluate the potential of this approach for protecting recombinant proteins from microbial proteolysis in the rumen, a marker was used. Batch cultures with rumen digesta showed that the majority of *P. pastoris* cells remained intact after an incubation period of 36 hours to 48 hours in clarified rumen and isolated bacterial fraction, while a much smaller part of *P. pastoris* cells in whole ruminal fluid remained intact after the same period of incubation and this was even lower in continuous culture (Rusitec). Other in vitro abomasal simulations showed that the major part of *P. pastoris* inoculated had lysed within 12 hours of incubation and this is an essential property for the release of encapsulated protein prior to the small intestine. These results imply that *P. pastoris* could be efficient as a vehicle for post-ruminal delivery of bioactive proteins in ruminants.

8 D-lactate production and excretion in diarrhoeic calves

Researchers

Ewaschuk, J.B.
Naylor, J.M.
Palmer, R.
Whiting, S.J.
Zello, G.A.

Main Canadian Institution

University of Saskatchewan

Western College of Veterinary Medicine

Journal of Veterinary Internal Medicine. 2004. Vol. 18, No. 5, p. 744-747.

The origin of D-lactate, the most important acid contributing to metabolic acidosis in the diarrhoeic calf, is unknown. In this research, the hypothesis was made that gastrointestinal fermentation is the source of diarrhoea because D-lactate is produced only by microbes. The object of the study was to determine if D-lactate production occurs in the rumen, colon or in both, and to evaluate D- and L-lactate concentrations in urine. Faecal, rumen, blood and urine samples were collected from healthy and diarrhoeic calves. Serum electrolyte concentrations were also measured and blood gas analyses were carried out for diarrheic calf samples. D- and L-lactate were also analyzed using high-performance liquid chromatography (HPLC). It was found that diarrhoeic calves were hyperkalemic in general and had high serum anion gap. Diarrhoeic calves also had depressed serum bicarbonate, low blood pH and higher L-lactate in rumen and faeces than healthy calves. Diarrhoeic calves also showed higher D-lactate concentrations in rumen, faecal, serum and urine. It was concluded that these results suggest rumen and faeces as sites for the source of D-lactate in blood and urine.

9 Endometrical cytology and ultrasonography for the detection of subclinical endometritis in postpartum dairy cows

Researchers

Kasimanickam, R.
Duffield, T.F.
Foster, R.A.
Garthley, C.
Leslie, K.E.
Walton, J.S.
Johnson, W.H.

Main Canadian Institution

UNIVERSITY of GUELPH

Theriogenology. 2004. Vol. 62, No. 1-2, p. 9-23.

This study aims to validate the use of endometrical cytology (EC) and ultrasonography (US) to diagnose subclinical endometritis in clinically normal postpartum dairy cows and to measure the impact of subclinical endometritis on reproductive performance. Two hundred twenty-eight clinically normal cows were selected among two dairy herds. The clinically normal status was defined on the basis of absence of abnormal discharge on external inspection and vaginoscopy at 20-33 days in milk. The cows were re-examined at 34-47 days in milk and followed during a minimum period of eight months. Reproductive tracts of cows were evaluated by transrectal palpation, US and EC. It was found that positive EC or fluid uterus upon first examination were associated with a significant decrease in the relative pregnancy rate and identified as subclinical endometritis cases. The same applied to those having positive EC or fluid uterus upon second examination. Relative pregnancy rates of 41% and 51% were found for cows with subclinical endometritis upon first and second examination, respectively. It was concluded that no diagnostic criteria based on transrectal palpation of the uterus had predictive value to assess pregnancy risks. Subclinical endometritis, diagnosed by US or EC, was found to be associated with a reduction in relative pregnancy rate.

10 Evaluation of a treatment protocol for intramammary infections in early postpartum dairy cows based on a positive California mastitis test result

Researchers

Wallace, J.A.
Stipetic, K.
Schukken, Y.H.
Dingwell, R.T.
Baillargeon, P.
Bacic, G.
Leslie, K.E.

Main Canadian Institution

Bovine Practitioner. 2004. Vol. 38, No. 1, p. 72-78.

The California Mastitis Test (CMT) is a tool used by producers to detect intramammary infections (IMI). However, many of them are in a dilemma when they are faced with positive CMT results. The aim of this study was then to assess the effectiveness of an intramammary treatment protocol based on a positive CMT result within the first three days of calving. The other parameters evaluated were the effect of intramammary antibiotic therapy on cure rates, linear somatic cell score (LS) and milk production for the first three Dairy Herd Improvement (DHI) tests post-calving. Dairy producers of 24 commercial herds tested the quarters of their cows with the CMT and sampled for milk bacteriology for the period between calving day to three days in milk. Cows with positive CMT results were given either an intramammary treatment with cephapirin sodium or no treatment. It was found that cure rates for all major pathogens were not significantly different between treated and non-treated cows whereas cure rates for environmental streptococcal infections were significantly different between the two groups. It was also found that recovery from infection caused by a major pathogen resulted in decreased linear score, which was associated with an increase in milk production. A relationship was found between the CMT score and milk production. Indeed, as the CMT score increased, milk production per test date decreased. It was concluded that this was an effective fresh cow protocol used to reduce IMI caused by environmental *streptococci*, which also reduces LS. Nevertheless, blanket therapy is not necessarily justified for all CMT-positive cows.

11 Expression profiles of p53 and p66shc during oxidative stress-induced senescence in foetal bovine fibroblasts

Researchers

Favetta, L.A.
Robert, C.
King, W.A.

Main Canadian Institution

Experimental Cell Research. 2004. Vol. 299, No. 1, p. 36-48.

The purpose of this study was to investigate the effects of different oxygen tensions and oxidative stress on cell longevity as well as to determine the role of p53 and p66shc in cells undergoing senescence. To perform this study, foetal bovine fibroblasts were cultured in either 20% O_2 or 5% O_2 atmospheres until they reached senescence. It was observed that fibroblasts cultured in 20% O_2 reached senescence after 30 population doublings with oxidative stress significantly high, while fibroblasts cultured in 5% O_2 did not reach the senescence point. A decrease in p53 mRNA was observed in 20% O_2 until senescence was reached. The p53 levels were also increased, just like p53 phosphorylation on serine 20. There was an association between senescence, p66shc mRNA and protein concentrations. These results suggest that p53 is potentially stabilized by posttranslational modifications during senescence and that there is an effect of oxidative stress on the replicative life span of foetal bovine fibroblasts. It was noted that p53, serine 20p53 phosphorylation and p66shc are also involved in senescence.

12 In vitro growth inhibition of major mastitis pathogens by *Staphylococcus chromogenes* originating from teat apices of dairy heifers

Researchers

de Vliegher, S.
Opsomer, G.
Vanrolleghem, A.
Devriese, L.A.
Sampimon, O.C.
Sol, J.
Barkema, H.W.
Haesebrouck, F.
de Kruif, A.

Main Canadian Institution

Veterinary Microbiology. 2004. Vol. 101, No. 3, p. 215-221.

The object of this study was to determine whether teat apex colonization by *Staphylococcus chromogenes* before calving in dairy heifers protects udder quarters against a higher SCC early after calving. To achieve this goal, the authors tested the in vitro inhibitory capability of *S. chromogenes* from teat apices of heifers towards some major mastitis pathogens with a modified cross-streaking method. It was found that two *S. chromogenes* isolates out of 10, both coming from the same heifer, inhibited the growth of all *Staphylococcus aureus*, *Streptococcus dysgalactiae* and *Streptococcus uberis* strains. However, the growth of *Escherichia coli* strains was not inhibited. It was concluded that the results of this study agreed with the protective effect of teat apex colonization by *S. chromogenes* by in vitro production of inhibitory substances.

13 Lack of effect of 10 kV/m 60 Hz electric field exposure on pregnant dairy heifer hormones

Researchers

Burchard, J.F.
Nguyen, D.H.
Monardes, H.G.
Petitclerc, D.

Main Canadian Institution

McGill

Bioelectromagnetics. 2004. Vol. 25, No. 4, p. 308-312.

The object of this experiment was to determine the effects from the exposure of dairy cattle to EF similar to those encountered directly underneath a 735-kV high-tension electrical power line carrying a maximum load of current. For the purpose of this research, 16 pregnant Holstein heifers were confined to wooden metabolism cages and exposed to a vertical electric field (EF) as well as to an artificial light cycle of 12 hours of light and 12 hours of darkness with groups of EF-exposed and non-exposed being formed. Heifers were subjected to different treatments during four weeks after the groups were switched over, the EF-exposed group becoming the non-exposed group and vice-versa for another four weeks. It was found that the exposure to EF cannot be associated with any variation in the serum concentration of progesterone (P4), prolactin (PRL) and insulin-like growth factor-1 (IGF-1) whereas the variation in melatonin (MLT) was associated with EF exposure. However, caution should be applied in the interpretation of this result as MLT response was inconsistent among different replicates.

14 *Lactobacillus rhamnosus* strain GG is a potential probiotic for calves

Researchers

Ewaschuk, J.B.
Naylor, J.M.
Chirino-Trejo, M.
Zello, G.A.

Main Canadian Institution

University of Saskatchewan
Western College of Veterinary Medicine

Canadian Journal of Veterinary Research. 2004. Vol. 68, No. 4, p. 249-253.

Since veterinary probiotics claiming to prevent or treat calf diarrhoea have not been well studied, the object of this study was to assess the capability of *Lactobacillus rhamnosus* strain GG (LGG) to maintain viability in the gastrointestinal tract of calves. It was to determine whether LGG can be administered in an oral rehydration solution (ORS) without compromising the efficacy of the ORS or the viability of LGG. It also meant to evaluate whether LGG produces D-lactate or not. The survival of LGG was investigated using 15 calves treated with high, medium or low LGG doses, which were administered orally with morning milk feeding on three consecutive days. Faecal samples were collected and incubated for 72 hours. The ORS was also incubated with LGG for 2 hours and then further incubated for 10 hours. It was found that glucose concentrations did not vary during the 2 hours of incubation. D-lactate was not produced. The LGG was still viable in the ORS. It was concluded that LGG survives intestinal transit in the young calf without producing D-lactate and that it can be administered in an ORS.

15 Milk antibodies against *Ostertagia ostertagi*: Relationships with milk IgG and production parameters in lactating dairy cattle

Researchers

Sanchez, J.
Markham, F.
Dohoo, I.
Sheppard, J.
Keefe, G.
Leslie, K.

Main Canadian Institution

Veterinary Parasitology. 2004. Vol. 120, No. 4, p. 319-330.

The object of this study was to assess the relationship between milk optical density ratios (ODR) (from an indirect *Ostertagia ostertagi* ELISA), total milk IgG, milk production, and the development of a correction factor applicable to ODR. It revealed a positive correlation between ODR and IgG values in milk, days in milk, age and log transformed SCC, while there was a negative relationship between ODR and milk production. There were constant IgG and ODR values for the period between 30 and 200 days in milk but ODR values were found to increase from 200 days in milk until the end of lactation. An increase in milk production was also found to be associated with a decrease in ODR values. These results suggest that ODR values are not influenced very much by production factors and that ODR values follow the same patterns as the variation in IgG throughout lactation. It would be possible to adjust ODR values to compare those obtained from high-production cows, with those of low-production cows.

16 Peripartum serum vitamin E, retinol and beta-carotene in dairy cattle and their associations with disease

Researchers

LeBlanc, S.J.
Herdt, T.H.
Seymour, W.M.
Duffield, T.F.
Leslie, K.E.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Dairy Science. 2004. Vol. 87, No. 3, p. 609-619.

The purpose of this study was to describe peripartum serum concentrations of alpha-tocopherol, beta-carotene and retinol and their association with disease risks. Blood samples were collected weekly from cows from 20 farms for the period from one week before calving until one week postpartum. The parameters measured were serum concentrations of alpha-tocopherol, beta-carotene and retinol as well as several biochemical variables. It was found that an increase in alpha-tocopherol of 1 microgram/mL in the week preceding calving decreased the risk of retained placenta by 20%, while a serum nonesterified fatty acid (FA) concentration equal or greater than 0.5 mEq/L increased the risk of retained placenta by 80% and a 100 ng/mL increase in serum retinol concentrations during the same period decreased the risk of clinical mastitis (CM) in early lactation by 60%. A significant positive relationship of peripartum concentrations between serum concentrations of alpha-tocopherol, beta-carotene and retinol was also observed.

17 Selenium status of dairy herds in Prince Edward Island

Researchers

Wichtel, J.J.
Keefe, G.P.
Van Leeuwen, J.A.
Spangler, E.
McNiven, M.A.
Ogilvie, T.H.

Main Canadian Institution

UPEI AVC

Canadian Veterinary Journal. 2004. Vol. 45, No. 2, p. 124-132.

This study aims to compare bulk tank milk selenium (Se) concentration with mean serum Se concentration. Fifteen herds were analyzed and tank milk Se concentration reflected well the Se status of the herd. A majority of herds surveyed were found to be marginal or deficient in Se at some point during the study, which increased risks for disease and suboptimal production in those herds. The worst periods for deficiency risks were in the fall and winter. The herds that received a supplementation in Se as a commercial dairy concentrate were four times more prone to be Se-adequate than other herds. They also had a slightly higher adjusted average daily milk yield (MY). It was concluded that many herds in Prince Edward Island are not receiving enough supplementary Se in their diet to meet their requirements.

18 Udder health in dairy cattle infected with *Neospora caninum*

Researchers

Peregrine, A.S.
Duffield, T.F.
Wideman, G.
Kelton, D.
Hobson, J.
Cramer, G.
Hietala, S.K.

Main Canadian Institution

UNIVERSITY of GUELPH

Preventive Veterinary Medecine. 2004. Vol. 64, No. 2-4, p. 101-112.

The object of this study was to assess the udder health of dairy cattle infected with *Neospora caninum* (NC) by analyzing blood samples for antibodies to NC using an ELISA. Samples were collected from 3,449 cows on 57 representative dairy herds in Ontario. Forty-eight herds contained at least one NC-seropositive animal. Using a standardized ELISA sample-to-positive cut-off of gtoreq0.45, the corrected seroprevalence was 8.2% overall and 10.1% within seropositive herds. At blood collection, the odds of NC-seropositive cows having a high linear score was 27% less than for seronegative cows, while at culling time, this was 22% less in NC-seropositive cattle. The odds of NC-seropositive cattle testing positive for an environmental pathogen on the second milk sample was 56% less than for seronegative animals. The odds were also 83% less at a higher ELISA sample-to-positive cut-off of gtoreq0.70. The odds of NC-seropositive cattle that developed a new infection with a major pathogen were 60% less than seronegative cows using the higher ELISA sample-to-positive cut-off.

19 Proteases involved in mammary tissue damage during endotoxin-induced mastitis in dairy cows

Researchers

Mehrzad, J.
Desrosiers, C.
Lauzon, K.
Robitaille, G.
Zhao, X.
Lacasse, P.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

Journal of Dairy Science. January 2005. Vol. 88, No. 1, p. 211-222.

The object of this study was to investigate the enzymes involved in bovine mammary tissue destruction with an endotoxin-induced mastitis model. Proteolytic activity of milk and induced mammary tissue during mastitis were evaluated with zymography techniques. The peak of proteolytic activity, bovine serum albumin (BSA) contents and mammary tissues damage were observed between 6 hours and 12 hours post-challenge. The authors also found that casein, gelatin, collagen, hemoglobin, mammary gland membrane proteins and lactoferrin were hydrolyzed by proteases of mastitic milk, which confirm that these proteases have a broad spectrum of activity. Proteolytic activity was also increased in mastitic tissues. Their results suggest that proteases in mastitis milk originate principally from milk polymorphonuclear neutrophils (PMN) and that these proteases are actively involved in udder tissue damage during

20 Association between somatic cell count in early lactation and culling of dairy heifers using Cox frailty models

Researchers

de Vliegher, S.
Barkema, H.W.
Opsomer, G.
de Kruif, A.
Duchateau, L.

Main Canadian Institution

Journal of Dairy Science. February 2005. Vol. 88, No. 2, p. 560-568.

The purpose of this research was to study the relationship between somatic cell count in early lactation (SCCel) and culling of dairy heifers, using the Cox frailty models. It revealed a close link between the two, which depended on five factors. There was a stronger association with data of SCCel recorded at 10 days in milk than earlier in lactation and only if culling events due to udder disorders were considered instead of all culling events. Culling hazard also increased along with the increase in test-day SCC. It was also observed that a higher test-day MY protected against culling and diminished the effect of SCCel. The negative effect of an elevated SCCel on the risk of culling was still present if SCC was below 50,000 cells per mL at the second test-day, although to a lesser extent.

21 Effect of eprinomectin treatment at calving on milk production in dairy herds with limited outdoor exposure

Researchers

Sithole, F.
Dohoo, I.
Leslie, K.
DesCoteaux, L.
Godden, S.
Campbell, J.
Stryhn, H.
Sanchez, J.

Main Canadian Institution

Journal of Dairy Science. March 2005. Vol. 88, No.3, p. 929-937.

The purpose of this research was to evaluate the effects of anthelmintic treatment at calving in herds totally confined or semiconfined during the summer period. Totally confined herds had no access to pasture and remained housed throughout summer, while semiconfined herds had limited outdoor exposure to a small pasture or paddock. All the cows were fed stored feeds adequate to meet their nutritional requirements. In both confined and semiconfined herds, cows were given an eprinomectin or placebo treatment around calving time and no significant effect between the two treatments were found. Faecal egg counts were determined to be low in general. Monthly milk samples were tested with an indirect ELISA using a crude *Ostertagia ostertagi* antigen with results recorded as ELISA ODR values. An interaction between treatment and ODR was observed. However, the authors concluded that their study failed to show a beneficial effect from the eprinomectin treatment in these herds.

22 Impacts of early lactation somatic cell count in heifers on milk yield over the first lactation

Researchers

De-Vliegher, S.
Barkema, H.W.
Stryhn, H.
Opsomer, G.
de-Kruif, A.

Main Canadian Institution

Journal of Dairy Science. March 2005. Vol. 88, No. 3, p. 938-947.

The purpose of this study was to evaluate the impact of somatic cell count (SCC) in early lactation (SCCel) of dairy heifers on test-day MY during the first lactation. An increase in SCCel was related to a decrease in MY and this relationship was even stronger when not taking the test-day SCC into account. This means that the negative effect caused by elevated SCCel was related to elevated test-day SCC later in lactation. An elevated SCCel at 14 days in milk had a more adverse effect than the same SCCel earlier in lactation. It was concluded that milk production during the first lactation is hindered by an elevated SCCel and that prevention is better than cure.

23 Effects of seropositivity for bovine leukemia, bovine viral diarrhoea virus, *Mycobacterium avium* subsp paratuberculosis and *Neospora caninum* on culling dairy cattle in four Canadian provinces

Researchers

Tiwari, A.
Van Leeuwen, J.A.
Dohoo, I.R.
Stryhn, H.
Keefe, G.P.
Haddad, J.P.

Main Canadian Institution

Veterinary Microbiology. August 2005. Vol. 109, No. 3-4, p. 147-158.

This study aims to determine the effects of seropositivity for exposure to bovine leukemia virus (BLV), bovine viral diarrhoea virus (BVBV), Mptb and NC on general and reason-specific culling in Canadian dairy cattle. They found that the MAP-seropositive cows run 1.38 times more risk of being culled, whatever the reason for culling, than the MAP-seronegative ones and this was 1.55 times for cows culled either for reproductive efficiency, decreased milk production or mastitis. In the case of culling for reproductive inefficiency, NC-seropositive cows ran a 1.43 times greater risk than NC-seronegative cows and in the case of culling for decreased milk production, this was 1.86 for cows in BVDV-seropositive herds compared to BVDV-seronegative herds. The authors concluded that these results will help in understanding the economic impacts of these pathogens and to justify their control.

24 Comparison of two enzyme-linked immunosorbent assays for diagnosis of *Mycobacterium avium* subsp paratuberculosis

Journal of Veterinary Diagnostic Investigation. September 2005. Vol. 17, No. 5, p. 463-466.

Researchers

McKenna, S.L.B.
Sockett, D.C.
Keefe, G.P.
McClure, J.
Van Leeuwen, J.A.
Barkema, H.W.

Main Canadian Institution

In order to do a first screening for the presence of Johne's Disease (JD) in a herd, enzyme-linked immunosorbent assays (ELISA) are often used. These tests have, however, quite low sensitivities but the inclusion of an absorption phase could potentially increase the specificity and decrease the sensivity of the ELISA test. Test characteristics of an absorbed and non-absorbed indirect ELISA to detect JD were compared. In the cow population used, it was found that the non-absorbed test had a lower specificity but did not have a higher sensitivity than the absorbed ELISA test.

25 Evaluation of three ELISAs for *Mycobacterium avium* subsp. paratuberculosis using tissue and faecal culture as comparison standards

Veteterinary Microbiology. September 2005. Vol. 110, No. 1-2, p. 105-111.

Researchers

McKenna, S.L.
Keefe, G.P.
Barkema, H.W.
Sockett, D.C.

Main Canadian Institution

The object of this study was to evaluate three serum ELISAs (one nonabsorbed and two absorbed indirect assay) for detection of antibodies against *Mycobacterium avium* subsp. paratuberculosis (Mptb). Comparison was made between the ELISAs and culture of tissue and faeces samples collected from 994 dairy cows at slaughter. Sixteen percent of the ileum and associated lymph nodes were cultured for Mptb-positive and 3.6% were faecal culture-positive for Mptb. Assessed sensitivities of the ELISAs were higher for the non-absorbed ELISA when compared to faecal and tissue culture than they were for the absorbed ELISAs, while the unabsorbed ELISA had a lower specificity. It was concluded that sensitivities of the ELISAs were low when compared to the tissue culture. The unabsorbed ELISA had a greater sensitivity and its specificity and accuracy were lower.

26 Associations between somatic cell count patterns and the incidence of clinical mastitis

Researchers

de Haas, Y.
Barkema, H.W.
Schukken, Y.H.
Veerkamp, R.F.

Main Canadian Institution

Preventive Veterinary Medicine, 2005. Vol. 67, No. 1, p. 55-68.

This study aims to determine the association between CM and the proportional distribution of patterns of somatic cell count (SCC) in a herd. In 274 dairy herds, 207,079 test days and 5,719 cases of CM were recorded. The larger portion of CM cases was associated with contagious pathogens. The distribution of SCC patterns was related to the incidence rate of CM. The authors concluded that the mean incidences of SCC patterns of a herd could be useful to determine whether or not to introduce pathogen-specific mastitis control programs in that herd.

27 Comparison of the cytobrush and uterine lavage techniques to evaluate endometrical cytology in clinically normal postpartum dairy cows

Researchers

Kasimanickam, R.
Duffield, T.F.
Foster, R.A.
Garthley, C.J.
Leslie, K.E.
Walton, J.S.
Johnson, W.H.

Main Canadian Institution

Canadian Veterinary Journal. 2005. Vol. 46, No. 3, p. 255-259.

This study aims to compare cytobrush and lavage techniques for the assessment of EC in clinically normal postpartum dairy cows. EC samples were collected from Holstein cows twice: at 20 to 33 days in milk and two weeks later, at 34 to 47 days in milk using both techniques defined. The mean percentage of cells that were neutrophils was significantly different upon the first visit but not on the second one. It was observed that the percentage of cells that were neutrophils decreased with time, after calving, but not within visit one or visit two. The uterine diameter was negatively related with fluid recovery by the lavage technique but the mean percentage of neutrophils cells was not influenced by the volume of fluid recovered in successful attempts. Nevertheless, 17% of attempts yielded no fluid. It was concluded that the cytobrush technique is a consistent and reliable technique to obtain endometrical samples for cytologic examination from postpartum dairy cows.

28 Determination of *Mycoplasma bovis* susceptibilities against six antimicrobial agents using the E test method

Researchers

Francoz, D.
Fortin, M.
Fecteau, G.
Messier, S.

Main Canadian Institution

Université de Montréal

Veterinary Microbiology. 2005. Vol. 105, No. 1, p. 57-64.

This study aimed to determine the susceptibility of *Mycoplasma bovis* against six antibiotics using the E test methodology. Fifty-eight isolates of *M. bovis* were collected from lung tissue, synovial fluid, tracheo-bronchial wash, milk and external or inner ear discharge. The antimicrobial agents tested were azythromycin, clindamycin, erythromycin, enrofloxacin, spectinomycin and tetracycline. It was found that resistance was not related to the specimen source, except for azythromycin. It was noted that E tests allowed us to determine the *M. bovis* susceptibilities, demonstrated the efficacy of enrofloxacin and the acquired resistance to tetracycline, spectinomycin, azythromycin, and clindamycin.

29 Effect of halofuginone lactate on the occurrence of *Crystosporidium parvum* and growth of neonatal dairy calves

Researchers

Jarvie, B.D.
Trotz-Williams, L.A.
McKnight, D.R.
Leslie, K.E.
Wallace, M.M.
Todd, C.G.
Sharpe, P.H.
Peregrine, A.S.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Dairy Science. 2005. Vol. 88, No. 5, p. 1801-1806.

The object of this study was to evaluate the effect of halofuginone lactate on the occurrence of *Crystosporidium parvum* and growth of neonatal dairy calves. Thirty-one Holstein bull calves were purchased at birth and assigned an oral treatment with halofuginone lactate in aqueous carrier solution or in placebo. It was found that the odds of *C. parvum* shedding among calves in the halofuginone lactate-treated group were 70% lower than in the placebo group. No oocyst shedding occurred until two weeks of age in the halofuginone-treated group, while some of the calves in the placebo group began shedding oocysts in their first week of age. In the placebo-treated calves group, 42.5% of the samples were positive to *C. parvum*, while only 22.4% of halofuginone-treated calves were positive. It was also observed that the largest number of positive tests to *C. parvum* occurred during the third week of age. It was noted, among calves treated with halofuginone lactate, there was a 3.1 days delaying the incidence of diarrhoea. .

30 Effect of paratuberculosis on culling, milk production and milk quality in dairy herds

Journal of the American Veterinary Medical Association. 2005. Vol. 227, No. 8, p. 1302-1308.

Researchers

Hendrick, S.H.
Kelton, D.F.
Leslie, K.E.
Lissemore, K.D.
Archambault, M.
Duffield, T.F.

Main Canadian Institution

UNIVERSITY of GUELPH

The purpose of this study was to evaluate the effects of paratuberculosis on culling, milk production and milk quality in infected dairy herds. Milk, blood and faecal samples were taken from 689 cows from nine herds. Faecal samples were evaluated with mycobacterial culture, serum samples with a commercially available ELISA for antibodies against Mptb and milk samples were tested with an indirect ELISA for antibodies against Mptb. It was established that cows with positive results of bacteriological culture of faeces and milk ELISA had a lower milk, fat and protein production. Cows with positive results for each test ran greater risks of culling. It was concluded that in these nine herds, paratuberculosis was associated with a decrease in milk production and cow longevity.

31 Effect of stress on viral-bacterial synergy in bovine respiratory disease: novel mechanisms to regulate inflammation

Researchers

Hodgson, P.D.
Aich, P.
Manuja, A.
Hokamp, K.
Roche, F.M.
Brinkman, F.S.L.
Potter, A.
Babiuk, L.A.
Griebel, P.J.

Main Canadian Institution

University of Saskatchewan

VIDO

Comparative and Functional Genomics. 2005. Vol. 6, No. 4, p. 244-250.

Environmental and nutritional changes, transportation, and social reorganization of weaned calves are all factors that can be linked to the severity of bovine respiratory infections. Fatal respiratory infections are usually the result of a viral-bacterial synergy. This occurs when a primary viral infection alters host defences and then augments the severity of a secondary bacterial infection and can happen as a result of different mechanisms. Host responses happening during these respiratory infections may be analyzed by the disease challenge models developed. A type of viral-bacterial synergy (primary bovine herpesvirus-1 (BHV-1) respiratory infection followed by a secondary challenge with *Mannheimia haemolytica*) that results in bovine respiratory disease (BRD) has been studied. This disease model was used in this research to demonstrate that the viral-bacterial synergy, resulting in fatal BRD, is significantly altered by stress. It was found that BHV-1 infection enhanced the expression of toll-like receptors (TLR) and increased pro-inflammatory responses, which increase the severity of a *M. haemolytica* infection. This showed that TLR plays a decisive role in bacterial infection detection as well as in inducing pro-inflammatory responses. Cell signalling pathways are activated by nuclear translocation of the glucocorticoid receptor, but it is not well understood how this form of viral-bacterial synergy can be enhanced by stress-induced corticosteroids.

32 Effect of trivalent vaccine against *Staphylococcus aureus* mastitis lymphocyte subpopulations, antibody production and neutrophil phagocytosis

Researchers

Lee-JaiWei
O'Brien, C.N.
Guidry, A.J.
Paape, M.J.
Shafer-Weaver, K.A.
Zhao, X.

Main Canadian Institution
McGill

Canadian Journal of Veterinary Research. 2005. Vol. 69, No. 1, p. 11-18.

The object of this study was to evaluate the effect of a novel bovine mastitis trivalent vaccine that contains *Staphylococcus aureus* capsular polysaccharide type 5 (T5), 8 (T8) and 336 (T336) on lymphocyte subpopulations, antibody production and neutrophil phagocytosis. Treatments consisted in an immunization with either the trivalent alone, trivalent emulsified in Freund's incomplete adjuvant (FICA), trivalent in aluminium hydroxide or adjuvant only (FICA). Twenty pregnant heifers were vaccinated 30 days before their due date for calving followed by two boosts in a two-week interval. It was found that serum antigen-specific immunoglobin (Ig)G1 and IgG2 were increased during the period from before calving until three weeks after calving for all vaccinated cows. Treatment with either adjuvant increased the production of IgG2 compared to the trivalent alone. A slight increase in immune sera neutrophil phagocytosis to the three types of killed *S. aureus* was noted but these were not significant due to a large variation between cows. Vaccinated cows showed a higher percentage of CD4+ lymphocyte four weeks after the first immunization, while cows vaccinated with trivalent vaccine and adjuvants had an increased percentage of CD8+ lymphocytes two weeks before and two weeks after calving. It was also observed that the whole cell trivalent vaccine elicits responses specific from the three capsular polysaccharide antigens. Finally, the increase of T8-specific and IgG2 was more visible in the case of vaccines with adjuvants.

33 Effects of monensin on meal frequency during sub-acute ruminal acidosis in dairy cows

Researchers

Lunn, D.E.
Mutsvangwa, T.
Odongo, N.E.
Duffield, T.F.
Bagg, R.
Dick, P.
Vessie, G.
McBride, B.W.

Main Canadian Institution
University of Guelph

Canadian Journal of Animal Science. 2005. Vol. 85, No. 2, p. 247-249.

The object of this study, conducted in two experiments, was to determine the effects of monensin (Rumensin (R) controlled-release capsule (CRC)) (exp.1) and Rumensin (R) Premix (exp.2) on meal frequency during grain-induced SARA in Holstein dairy cows. With both types of Rumensin, meal frequency was lower during SARA periods than during adaptation and recovery periods. However, in experiment 2, the administration of monensin increased meal frequency both during SARA and recovery periods. It was suggested that monensin premix may increase meal frequency in lactating dairy cows under SARA.

34 Efficacy of an iodophore teat disinfectant against *Staphylococcus aureus* and *Streptococcus agalactiae* in experimental challenge

Researchers

Leslie, K.E.
Petersson, C.S.
Vernooy, E.
Bashiri, A.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Dairy Science. 2005. Vol. 88, No. 1, p. 406-410.

The object of this study was to assess the efficiency of a 1% iodophore teat disinfectant (Full-Bac) compared with a positive control (Bovadine), which is a commercially available 1% iodophore teat disinfectant. The comparison was made using 41 cows during a 10-week period. In new inflammatory infections by *Staphylococcus aureus* and *Streptococcus agalactiae*, there were no differences between the test product and the positive control. There was no difference either in teat skin and teat end condition scores. Both tests provided similar germicidal activity during the warm season study period.

35 Efficacy of saponin-adjuvanted inactivated respiratory syncytial virus vaccine in calves

Researchers

Ellis, J.A.
West, K.H.
Waldner, C.
Rhodes, C.

Main Canadian Institution

UNIVERSITY OF SASKATCHEWAN

Western College of Veterinary Medicine

Canadian Veterinary Journal. 2005. Vol. 46, No. 2, p. 155-162.

This study aims to evaluate whether a commercially available saponin-adjuvant, inactivated bovine respiratory syncytial virus (BRSV) vaccine would protect calves from experimental infection with virulent BRSV. Seronegative BRSV calves were first either unvaccinated or vaccinated twice with an inactivated BRSV vaccine. All calves were later challenged with virulent BRSV. Parameters evaluated following the challenge were clinical signs, arterial PO2 and immune responses. Eight days after the challenge, calves were euthanized and their lungs examined. It was found that the inactivated BRSV vaccine successfully afforded clinical protection from experimental infection with the virulent virus 27 days after immunization. It also decreased the prevalence and severity of pulmonary lesions. Efficacy monitored with this vaccine was similar to that of other inactivated and modified-live BRVS vaccines available on the market.

36 Efficacy of several serological tests and antigens for diagnosis of bovine brucellosis in the presence of false-positive serological results due to *Yersinia enterocolitica* O :9

Researchers

Munoz, P.M.
Marin, C.M.
Monreal, D.
Gonzalez, D.
Garin-Bastuji, B.
Diaz, R.
Mainar-Jaime, R.C.
Moriyon, I.
Blasco, J.M.

Main Canadian Institution

University of Saskatchewan

Western College of Veterinary Medicine

Clinical and Diagnostic Laboratory Immunology. 2005. Vol. 12, No. 1, p. 141-151.

The purpose of this study was to test in ELISA and precipitation tests brucella S-LPS, cross-reacting S-LPSs representing several O-chain epitope combinations, brucella core lipid A epitopes (rough LPS), brucella abortus S-LPS-derived polysaccharide, native hapten polysaccharide, rough LPS group 3 outer membrane protein complexes, recombinant BP26 and cytosolic proteins. The aim of these tests was to detect cattle brucellosis (sensitivity) and to differenciate it from false-positive serological reactions (FPSR) (specificity). It was found that no single serological test and antigen combination had a 100% sensitivity and specificity simultaneously. Immunoprecipitation tests with native hapten polysaccharide, counterimmunoelectrophoresis with cytosolic proteins and a chaotropic ELISA with Brucella S-LPS, were 100% specific. However, their sensitivity was lower than with the Rose Bengal test, complement fixation and indirect ELISA with brucella S-LPSs and native hapten or S-LPS-derived polysaccharides. The competitive ELISA with brucella S-LPS and M84 C/Y-specific monoclonal antibody was less specific and sensitive than the other tests. Sensitivity/specificity ratios of ELISA with brucella suis bv. 2 S-LPS, *Escherichia hermannii* S-LPSs, BP26 recombinant protein and brucella cytosolic fractions were not adequate. It was concluded that none of these combinations fully resolved the diagnosis of bovine brucellosis in the presence of FPSR. Nonetheless, some of these are quite simple and provide practical alternatives to the brucellin skin test currently used for differential diagnosis.

37 Evaluation of bovine cutaneous delayed-type hypersensitivity to various test antigens and a mitogen using several adjuvants

Researchers

Veterinary Immunology and Immunopathology. 2005. Vol. 104, No. 1-2, p. 45-48.

Hernandez, A.
Yager, J.A.
Wilkie, B.N.
Leslie, K.E.
Mallard, B.A.

In this study, various alternative antigen/adjuvant combinations to the bacillus calmette Guerin (BCG)-induced/purified protein derivative (PPD)-elicited tuberculin skin test were evaluated as inducers of delayed-type hypersensitivity (DTH). They were compared to the BCG/PPD test system in order to find a skin DTH protocol that does not cross-react with the tuberculin test and allows identification of high and low CMIR responder phenotypes. Thirty non-lactating cows were sensitized with mycobacteria (BCG, MCWE) and ovalbumin emulsified in Freund's complete adjuvant, non-ulcerative Freund's adjuvant (NUVA), complete NUVA or MCWE. Three weeks later, cows were injected intradermally with various test antigens including PPD tuberculin, phlein and ovalbumin (OVA). As a negative control, phosphate buffered saline was included and T-cell mitogen phytomegglutinin (PHA) was administrated. Finally, treatments of BCG/PPD and *Mycobacterium phlei/phlein* were given with a Freund's adjuvant-induced equivalent DTH with peak reactions at 24 hours to 48 hours after the antigen injection. It was found that the /phlein system induced DTH and was similar to DTH induced by the BCG/PPD system when MCWE was given with a Freund's adjuvant. It was concluded that this protocol was suitable for detecting high/low CMIR responders in research herds but cross-reaction to PPD was evident following induction of DTH using *M. phlei*. Nevertheless, the protocol does not ease the problem of artificial induction of DTH cross-reactivity and would not be suitable for commercial herds where tuberculin testing is required.

Main Canadian Institution

UNIVERSITY of GUELPH

38 Evaluation of enzyme-linked immunosorbent assays performed on milk and serum samples for detection of paratuberculosis in lactating dairy cows

Journal of the American Veterinary Medical Association. 2005. Vol. 226, No. 3, p. 424-428.

Researchers

Hendrick, S.H.
Duffield, T.F.
Kelton, D.F.
Leslie, K.E.
Lissemore, K.D.
Archambault, M.

Main Canadian Institution

UNIVERSITY of GUELPH

The object of this study was to determine whether results obtained for milk and serum samples with ELISAs intended for diagnosis of paratuberculosis in dairy cows were comparable to those obtained by means of mycobacterial culture of faecal samples. Samples were taken from 689 lactating dairy cows in nine herds from Ontario. Faecal samples were tested with mycobacterial cultures and serum samples tested for antibodies against Mptb with ELISA. Milk samples were tested with an indirect ELISA for antibodies against Mptb. Results were positive for 18.9% of the serum samples, 11.1% of milk samples and 10.4% of faecal samples. There was a moderate correlation between faecal and milk results. Faecal and serum samples gave results that were significantly different; results from milk samples had a higher correlation with those of mycobacterial culture than those of serum samples. Results suggest that the indirect ELISA test used on milk samples could provide a good method for detecting paratuberculosis in dairy herds.

39 The impact of controlled-release capsules of monensin on post calving haptoglobin concentrations in dairy cattle

Researchers

Crawford, R.G.
Leslie, K.E.
Bagg, R.
Dick, C.P.
Duffield, T.F.

Main Canadian Institution

UNIVERSITY of GUELPH

Canadian Journal of Veterinary Research. 2005. Vol. 69, No. 3, p. 208-214.

The object of this study was to assess the impact of a controlled-release capsule (CRC) of monensin given before calving on post-calving haptoglobin and to study the role of the disease on haptoglobin. Twenty-five Ontario dairy herds (1,010 cows) were given random monensin CRC or placebo capsules three weeks before calving. It was observed that haptoglobin concentrations were higher one week after calving than six weeks after. In univariate analysis, many diseases were associated with haptoglobin concentrations. Though, the occurrence of diseases seemed to be a confounding factor in the data interpretation. The authors then stratified the analysis by the presence or absence of the disease. There seemed to be a relationship between factors other than clinical disease that contributed to increased concentrations of haptoglobin. However, haptoglobin served as a good indicator of inflammatory disease. In clinically unhealthy cows, monensin CRC treatment was associated with increased haptoglobin concentrations. Lower concentrations of haptoglobin in monensin CRC-treated healthy cows suggest a possible reflection of reduced subclinical disease.

40 Isolation of a bovine plasma fibronectin-containing complex that inhibits the expression of bovine leukemia virus

Researchers

Van den Heuvel, M.J.
Jefferson, B.J.
Jacobs, R.M.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Virology. 2005. Vol. 79, No. 13, p. 8164-8170.

The purpose of this study was to describe the purification of a plasma blocking factor (PBF) whose activity was resistant to heating to 65 °C for 10 minutes and was attributable to fibronectin-containing complex of about 320 kDa under non-reducing conditions. A protein with a size of 220 kDa and a pI of 5.4 was identified as a member of the fibronectin group of molecules by using a two-dimensional polyacrylamide gel electrophoresis and matrix-assisted laser desorption ionization time of flight (mass spectrometry). Both the purified protein and commercially available bovine fibronectin inhibited BLV production in naturally infected peripheral blood mononuclear cells. However, the fibronectin was less biologically active.

41 Metabolic predictors of displaced abomasum in dairy cattle

Researchers

Leblanc, S.J.
Leslie, K.E.
Duffield, T.F.

Journal of Dairy Science. 2005. Vol. 88, No. 1, p. 159-170.

This study aims to identify metabolic tests available in clinical practice that identified cows at increased risk of left displaced abomasums (LDA). Cows from 20 herds (1,044 cows) were visited from one week before to one week after calving. Body condition scores were recorded and samples collected and analyzed for serum non-esterified fatty acids (NEFA), cholesterol, beta-hydroxybutyrate (BHBA), glucose, urea, calcium, and phosphorus. Milk samples were collected one week after calving to measure the BHBA concentration. It was found there were 53 LDA cases and the median time for diagnosing the disorder was 11 days in milk. Before calving, only NEFA concentrations were associated with the risk of developing LDA. Cows having a NEFA concentration equal to or higher than 0.5 mEq/L were 3.6 times more liable to developing LDA after calving. Retained placenta, metritis and increased serum concentrations of BHBA and NEFA were related with an increased risk of subsequent LDA with BHBA serum concentrations after calving as being a more sensitive and specific test than NEFA concentration. Cows having a milk BHBA concentration equal to or superior to 200 micro mol/L were 3.4 times more likely to develop LDA. It was concluded that metabolic tests for transition dairy cows should focus on NEFA in the week preceding calving and BHBA in the first week after calving.

Main Canadian Institution

UNIVERSITY of GUELPH

42 Microarrays analysis of gene expression following preparation of sterile intestinal "loops" in calves

Researchers

Aich, P.
Wilson, H.L.
Rawlyk, N.A.
Jalal, S.
Kaushik, R.S.
Begg, A.A.
Potter, A.A.
Babiuk, L.A.
Abrahamsen, M.S.
Griebel, P.J.

Main Canadian Institution

University of Saskatchewan

VIDO

Canadian Journal of Animal Science. 2005. Vol. 85, No. 1, p. 13-22.

Vaccine-induced mucosal immune responses in ruminants can be effectively analyzed by the surgical preparation of multiple, sterile intestinal "loops." This study aimed to evaluate intestinal "loops" as a model for genomic analysis of mucosal immune responses. Microarray analyses were performed to determine if gene expression in the small intestine of one month-old calves is altered by surgery and elimination of microflora. Expressed sequence tags (EST) significantly and differentially changed in expression at 2.3%, 48 hours after the surgery, whereas 80% of these genes were up-regulated. It was demonstrated that 12 days after surgery, a large portion of genes were returning to baseline expression. It was found that only a minor number of genes were altered by surgery and elimination of microflora, but these ones were tightly involved to normal mucosal function. It was concluded that intestinal "loops" must be included in the conduction of mucosal gene expression analyses with the one-month-old calf.

43 Molecular analyses of disease pathogenesis: Application of bovine microarrays

Researchers

Wilson, H.L.
Aich, P.
Roche, F.M.
Jalal, S.
Hodgson, P.D.
Brinkman, F.S.L.
Potter, A.
Babiuk, L.A.
Griebel, P.J.

Main Canadian Institution

University of Saskatchewan
VIDO

Veterinary Immunology and Immunopathology. 2005. Vol. 105, No. 3-4, p. 277-287.

The lack of availability of tools to analyze host and pathogen responses is a limiting factor in the molecular analysis of disease pathogenesis. However, new methodologies such as microarrays are now counteracting these limitations as they permit a rapid characterization of global gene expression of individual cells and tissues. This review addresses mainly the microarrays technologies as a mean to investigate the functional pathogenomics of infectious disease in cattle. A number of issues that are essential to consider when designing in vitro and in vivo model systems to analyze host responses to a specific pathogen and comparative functional genomic strategies are discussed here. These strategies are also applicable for the investigation of cell-signalling pathways and analysis of innate immune responses. Future generations of database could be enriched by these microarrays analyses of host and pathogen responses. Limitations of these comparative analyses as regards quality of databases, the complete functional annotation of the bovine genome, and an indication of future developments to accelerate the validation of data generated when a molecular characterization of disease pathogenesis in cattle are also discussed.

44 Prevalence of *Cryptosporidium parvum* infection in southwestern Ontario and its association with diarrhoea in neonatal dairy calves

Researchers

Trotz-Williams, L.A.
Jarvie, B.D.
Martin, S.W.
Leslie, K.E.
Peregrine, A.S.

Main Canadian Institution

University of Guelph

Canadian Veterinary Journal. 2005. Vol. 46, No. 4, p. 349-351.

The prevalence of *Cryptosporidium parvum* infection was evaluated in 500 dairy calves of southwestern Ontario and its association with diarrhoea in neonatal dairy calves was also assessed. The infection was detected in 40.6% of calves and within-farm prevalence ranged from 0% to 70%. It was also found that both shedding and intensity of shedding were significantly related to diarrhoea. It was concluded that this was a common parasite in Ontario dairy calves and was an important cause of dairy calf scours.

45 Purified bovine plasma blocking factor decreases bovine leukemia virus expression, while increasing protein synthesis and transcriptional activity of peripheral blood mononuclear cells in short-term culture

Researchers

Van den Heuvel, M.J.
Jefferson, B.J.
Jacobs, R.M.

Main Canadian Institution

UNIVERSITY of GUELPH

Canadian Journal of Veterinary Research. 2005. Vol. 69, No. 3, p. 186-192.

This study aims to assess the effects of bovine plasma on cell viability and BLV p24 expression as well as the effects of purified PBF on protein synthesis and gene expression of short-term cultures of bovine lymphocytes. It was found that the addition of 25% plasma or semi-purified PBF to cultures had no significant effect on cell viability. However, it caused a significant decrease in BLV p24 production and significantly increased de novo protein synthesis. RNA messages of 83 genes involved in cell division, cell metabolism and gene regulation were up-regulated using a human microarray.

46 Relationship between glucose transport and metabolism in isolated bovine mammary epithelial cells

Researchers

Xiao, C.T.
Cant, J.P.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Dairy Science. 2005. Vol. 88, No. 8, p. 2794-2805.

Glucose transport by isolated bovine mammary epithelial cells involves translocation across the cell membrane into a compartment that exchanges slowly with bulk cytosol. This research aims to examine, using generation, modeling, transport analysis and metabolism data, the significance to glucose metabolism of this compartmentalization. Time-course curves were subjected to compartmental analysis in order to obtain glucose transport model parameters whereas lactose synthesis, glucose oxidation rates and cellular concentrations of intermediary metabolites, glucose-6-phosphate and glucose-1-phosphate were measured at varied media glucose concentrations. It was found that the model that integrates glucose transport and metabolism under-predicted the rates of lactose synthesis and glucose oxidation. Glucose should be available for phosphorylation once translocated across the cell membrane in order to account for the rates of observed glucose use. At physiological glucose concentrations, metabolic control analysis indicated that phosphorylation by hexokinase exerts 80% of the control of glucose metabolism to lactose and CO_2, while transport exerts the remaining 20%.

47 A review of *Neospora caninum* in dairy and beef cattle. A Canadian perspective

Researchers

Haddad, J.P.A.
Dohoo, I.R.
Van Leewen, J.A.

Main Canadian Institution

Canadian Veterinary Journal. 2005. Vol. 46, No. 3, p. 230-243.

This review summarized the current understanding of *Neospora caninum* (NC) in dairy and beef cattle for Canadian bovine specialists. The life cycle of the agent, its transmission mechanisms, clinical signs, tests to diagnose the infection, impacts of the infection, risks factors of its occurrence and control methods are covered in the review. It also contains data on the prevalence of the infection in Canadian dairy and beef cattle and comparisons with the prevalence in other countries. This review provides the information necessary to design more effective programs for the control of NC-associated disease.

48 Risk factors associated with *Neospora caninum* abortion in Ontario Holstein dairy herds

Researchers

Hobson, J.C.
Duffield, T.F
Kelton, D.
Lissemore, K.
Hietala, S.K.
Leslie, K.E.
McEwen, B.
Peregrine, A.S.

Main Canadian Institution

Veterinary Parasitology. 2005. Vol. 127, No. 3-4, p. 177-188.

This epidemiological research aims to identify risk factors for *Neospora caninum (*NC)-related abortions in Ontario Holstein dairy herds. Cows from 88 herds were blood sampled and sera were analyzed for antibodies to NC using a kinetic ELISA. Information concerning housing, animal species present, manure management, reproduction, biosecurity practices, wildlife observations, peri-parturient cow management, herd disease history and nutrition were collected among dairy herds. It was found that the NC herd seroprevalence, the number of dogs per farm, the frequency that dogs were observed defecating in mangers, the number of horses per farm and the observed annual rate of cows returning to oestrus after pregnancy confirmation were positively related to NC abortions in a herd. However, frequency of stray cats and wild canids observed on a farm and the housing of heifers on loafing packs were negatively related to NC abortions in a herd.

49 Seroprevalence of antibodies against bovine leukemia virus, bovine viral diarrhoea virus, *Mycobacterium avium* subspecies paratuberculosis and *Neospora caninum* in dairy cattle in Saskatchewan

Researchers

Van Leeuwen, J.A.
Forsythe, L.A.
Tiwari, A.
Chartier, R.

Main Canadian Institution

Canadian Veterinary Journal. 2005. Vol. 46, No. 1, p. 56-58.

To evaluate the seroprevalence of antibodies against bovine leukemia virus (BLV), bovine viral diarrhoea virus (BVDV), *Mycobacterium avium* subsp. paratuberculosis (Mptb) and *Neospora caninum* (NC) in dairy cattle in Saskatchewan, blood samples were taken from 1,530 dairy cows in 51 dairy herds. Cows tested positive for antibodies against BLV, Mptb and NC at percentages of 37.4%, 2.7%, and 5.6% respectively and 29.2% of evaluated herds had unvaccinated cows that were seropositive for BVDV.

50 Short communication: Infrared thermography and visual examination of hooves of dairy cows in two stages of lactation

Researchers

Nikkhah, A.
Plaizier, J.C.
Einarson, M.S.
Berry, R.J.
Scott, S.L.
Kennedy, A.D.

Main Canadian Institution

Journal of Dairy Science. 2005. Vol. 88, No. 8, p. 2749-2753.

In this research, the hooves of 16 lactating Holstein cows were examined twice with infrared (IR) thermography and visual examination for sole hemorrhages and underrun heels. It was found that the temperatures of the coronary bands of cows were higher for early/midlactation cows than for late-lactation cows. [Delta] T was also higher for lateral claws than for medial claws. The frequency of sole hemorrhages in hind lateral claws was higher for early/midlactation cows, while underrun heel was more frequent in late-lactation cows. Increased temperatures of the coronary band and [Delta] T in early/midlactation coincided with an increase in the incidence of sole hemorrhages. As cows in early/midlactation showed higher hoof temperatures, measurement of hoof temperatures among cows in early lactation may be useful in monitoring hoof health.

51 Synovial fluid changes in induced infectious arthritis in calves

Researchers

Francoz, D.
Desrochers, A.
Fecteau, G.
Desautels, C.
Latouche, J.S.
Fortin, M.

Main Canadian Institution

Université de Montréal

Journal of Veterinary Internal Medecine. 2005. Vol. 19, No. 3, p. 336-43.

This study aimed to develop an experimental model of septic arthritis in calves from which to evaluate the treatment effect on cytologic and bacteriologic variables of synovial fluid. To perform this study, the right tarsus of seven healthy Holstein bull calves were inoculated with 10(8) colony-forming units of viable *Escherichia coli* of a pap-positive strain. Clinical signs of septic arthritis were observed during days 2 and 9 in all calves. On Day 2, the bacterial cultures of all calves were *E. coli*-positive. One calf remained positive until Day 3 and five calves remained positive until Day 4. Polymerase chain reaction (PCR) results were also positive for all calves and remained positive for various periods among calves, but were all positive again on Day 24. On days 2 to 4, synovial fluid neutrophil counts and white blood cell counts increased, while synovial total protein concentrations increased during all the experimental period compared to Day 1. Clinicopathological signs of inflammation persisted for 20 days. However, bacterial cultures were negative on Day 8. It was concluded that this model successfully induced acute septic arthritis and if treated at the beginning of the disease, it was possible for calves to recover within one week.

52 Thrombospondin and vascular endothelial growth factor are cyclically expressed in an inverse pattern during bovine ovarian follicle development

Researchers

Greenaway, J.
Gentry, P.A.
Feige, J.J.
LaMarre, J.
Petrik, J.J.

Biology of Reproduction. 2005. Vol. 72, No. 5, p. 1071-1078.

This study aims to evaluate the expression of the antiangiogenic thrombospondin (TSP) family and proangiogenic vascular endothelial growth factor (VEGF) in various sizes of healthy bovine follicles. Ovaries were collected from slaughterhouses and healthy follicles were sorted on the basis of size: small, medium and large. It was found that TSP was significantly higher in small follicles such as TSP-1 and TSP-2 mRNA. The granulosa layer was found to be the primary area within the follicle involved in TSP generation and small follicles had the highest proportion of immunopositive cells. It was also observed that TSP colocalized with CD36 on granulosa cells in the follicle and in cultured cells and FSH stimulated GC expression of TSP. VEGF expression increased during growth and development of follicle. The authors concluded that TSP-1 and -2 were coordinately expressed in the extravascular compartment of the ovary during the early follicle development and VEGF was inversely expressed. These results suggest that these proteins may be involved in regulating growth and development of the follicle in a novel fashion.

Main Canadian Institution

UNIVERSITY of GUELPH

53 The use of an indirect Ostertagia ostertagi ELISA to predict milk production response after anthelmintic treatment in confined and semi-confined dairy herds

Researchers

Sanchez, J.
Dohoo, I.
Leslie, K.
Keefe, G.
Markham, F.
Sithole, F.

Main Canadian Institution

Veterinary Parasitology. 2005. Vol. 130, No. 1-2, p. 115-124.

The object of this study was to determine whether or not the milk production response from endectocide treatment at calving could be predicted. To achieve this, an indirect Ostertagia ostertagi ELISA was used in late-lactation milk samples collected from cows in confined and semi-confined dairy herds from Prince Edward Island, Nova Scotia and southern Ontario. Cows were treated with eprinomectin pour-on endectocide or with a placebo solution and results of the indirect ELISA test were expressed as optical density ratios (ODR). A seasonal pattern was found in pre-calving ODR to be higher in summer and fall and lower in winter. Pre-calving ODR values were also higher in older cow samples. Samples from confined and semi-confined herds varied in their parasite antibodies, which were greater in the semi-confined herd samples. Furthermore, there was a significant interaction effect between treatment and pre-calving ODR on milk production response after endectocide treatment. It was concluded that the relationship between pre-calving ODR and production response appeared to be quadratic and that ODR values could be used to predict the expected response to anthelmintic treatment.

54 Use of a quantitative strong ion approach to determine the mechanism for acid-base abnormalities in sick calves with or without diarrhoea

Researchers

Constable, P.D.
Stampfli, H.R.
Navetat, H.
Berchtold, J.
Schelcher, F.

Main Canadian Institution

Journal of Veterinary Internal Medicine. 2005. Vol. 19, No. 4, p. 581-589.

The purpose of this study was to experimentally evaluate A(tot), K-alpha and net protein charge values for calf plasma in order to apply them quantitatively to data from sick calves to determine underlying mechanisms for the observed acid-base disturbance. Mean values for calf plasma were A (tot) =0.343 mmol/g of total protein or 0.662 mmol/g of albumin, while K-alpha gave 7.08. The net protein charge of calf plasma was 10.5 mEq/L, which is equivalent to 0.19 mEq/g of total protein or 0.34 mEq/g of albumin. It was found that acidemia was mostly due to a strong ion acidosis in response to hyponatremia accompanied by normochloremia or hyperchloremia and the presence of unidentified strong anions. Results obtained from this study confirm current recommendations that treatment of acidemia in sick calves should focus on intravenous or per os (PO) administration of a fluid containing sodium and a high effective single intradermal tuberculin test (SID), independently of the presence or absence of diarrhoea.

Herd Management

1 Association of herd milk production and management with a return-over-feed index in Ontario dairy herds

Researchers

McLaren, C.J.
Lissemore, K.D.
Duffield, T.F.
Leslie, K.E.
Kelton, D.F.
Grexton, B.

Main Canadian Institution

UNIVERSITY of GUELPH

Journal of Dairy Science. 2005. Vol. 88, No. 1, p. 419-425.

The object of this research was to evaluate the associations of herd milk production and the management variables to a return-over-feed (ROF) herd profit index. The ROF index was derived from milk income and feed cost, which are two important profit determinants in dairy farms. Data concerning nutrition, housing, health, herd milk production, milk component percentages, and somatic cells count from 95 dairy herds of Ontario were collected. Standardized milk production, milk protein percentage, milk fat percentage, and the use of monensin in lactating cow diets were included in the linear regression model accounting for a significant variation in the ROF. It was found that a 1 kg increase of standardized milk production per day per cow was associated with an increase of $0.35/day per cow, while an increase of 0.1% in milk protein was associated with an increase of $0.26/day per cow in the ROF of the dairy herd. The use of monensin was also associated with a $0.39/day ROF increase per cow. However, an increase in milk fat led to a $0.10/day ROF decrease per cow. It was also found that herds milked three times a day produced a higher $1.25/day ROF per cow. Vaccination for *Escherichia coli* mastitis was associated with a $0.59/day ROF increase per cow. The authors concluded that the variables related to production accounted for more important variations in the ROF index than the management variables, which only marginally increased R2 of production-based regression models.

Reproduction

1 Different culture media requirements of in vitro fertilization and nuclear transfer bovine embryos

Researchers

Mastromonaco, G.F.
Semple, E.
Robert, C.
Rho, G.J.
Betts, D.H.
King, W.A.

Reproduction in Domestic Animals. 2004. Vol. 39, No.6, p. 462-467.

In vitro fertilization (IVF) and nuclear transfer (NT) bovine embryos are two quite different techniques. Although the in vitro development is similar in both techniques, post-implantation survival is significantly reduced in NT embryos. The aim of this research was to compare serum and bovine serum albumin (BSA) supplementation during oocytes maturation, and embryo culture of IVF and NT embryos. Two experiments were conducted. The first consisted in treating oocytes and embryos during maturation and/or culture with synthetic oviductal fluid (SOF) medium supplemented with either serum, fatty acid (FA)-free BSA (FAF) or fraction V BSA in order to evaluate the in vitro fertilized embryo development. To evaluate NT embryo development, a second experiment was performed in which oocytes were matured with either SOF and FAF or with SOF plus serum while reconstructed embryos were cultured with both SOF and FAF. The steer serum group showed a higher number of blastocysts on Day 6 in the in vitro fertilized groups. Hatching frequencies were also higher for groups with serum on days 8 and 9 save for FAF on Day 9. A higher proportion of MII oocytes, an increased blastocyst development and hatching rates were found in the presence of serum during IVM for the NT treatment groups. It was concluded that in the case of IVF, both serum and FAF provide similar embryo development, which is not the case for NT bovine embryos.

Main Canadian Institution

UNIVERSITÉ LAVAL

2 Effect of interferon- tau on prostaglandin biosynthesis, transport and signalling at the time of maternal recognition of pregnancy in cattle: evidence of polycrine actions of prostaglandin E2

Researchers

Arosh, J.A.
Banu, S.K.
Kimmins, S.
Chapdelaine, P.
MacLaren, L.A.
Fortier, M.A.

Main Canadian Institution

Nova Scotia Agricultural College

Endocrinology. 2004. Vol. 145, No. 11, p. 5280-5293.

Many interactions between conceptus, uterus and corpus luteum (CL) are involved in the recognition and establishment of pregnancy. In ruminants, interferon- tau (IFN tau), of embryonic origin, is the pregnancy recognition signal whereas endometrical prostaglandin F2 alpha (PGF2 alpha) is the luteolysin and PGE2 is a luteoprotective mediator at establishment of pregnancy. However, the relationship between IFN tau and endometrical PGs production, transport and signalling at the time of maternal recognition of pregnancy (MRP) still is largely unknown. The aim of this research is then to study this relationship. The expression of the enzymes involved in the metabolism of PGE2 and PGF2 alpha, cycooxygenase-1 (COX-1) and COX-2, PG synthases (PGES and PGFS), PG 15-dehydrogenase, PG transporters, PGE2 and PGF2 alpha receptors were examined. It appeared, after analysis of the results, that IFN tau increases either directly or indirectly PGE2 biosynthesis as well as EP2-associated signaling in endometrium, myometrium and corpus luteum during the MRP. Results also suggest that PGE2 could be involved with endometrical receptivity, myometrial quiescence and luteal maintenance, which indicates polycrine actions of PGE2 at MRP. It was concluded that the inhibition of PGF2 alpha and the increase in PGE2 production are essential for the establishment of pregnancy in dairy cattle.

3 Embryonic diapause and its regulation

Researchers

Lopes, F.L.
Desmarais, J.A.
Murphy, B.D.

Main Canadian Institution

Université de Montréal

Reproduction. 2004. Vol. 128, No. 6, p. 669-678.

A suppression of cell proliferation occurring at the blastocyst stage causes a condition known as embryonic diapause. This is a condition of temporary suspension for the development of the mammalian embryo. It is an evolutionary strategy to guarantee the survival of neonates. There are two types of diapause: obligate and facultative. The obligate diapause occurs in each gestation in some species, while the facultative diapause is usually associated with lactation, which causes an important metabolic stress to the mammalian. The environmental, hypopheasal, ovarian and uterine mechanisms are the regulators, although these may vary among species and between obligate and facultative condition, of the onset, maintenance and escape from diapause. At the G0 or G1 phase of the mammalian embryo cell cycle, a mitosis arrest occurs, which may be caused by the expression of a specific cell cycle inhibitor. The proliferation reprise in mammalian species may be regulated by the expression of orthologous genes. The proliferation regulation in non-mammalian models may help in understanding that matter.

4 Localization of the chaperone proteins GRP78 and HSP60 on the luminal surface of bovine oviduct eptithelial cells and their association with spermatozoa

Researchers

Boilard, M.
Reyes-Moreno, C.
Lachance, C.
Massicotte, L.
Bailey, J.L.
Sirard, M.A.
Leclerc, P.

Main Canadian Institution

Université Laval

Biology of Reproduction. 2004. Vol. 71, No. 6, p. 1879-1889.

The bovine spermatozoa bind to the epithelial cells of the oviduct to remain alive until fertilization. Carbohydrate components of the latter are involved in these sperm/oviduct interactions. However, no protein has been identified to play this role. The object of this study was to identify the oviduct factors involved in the survival of bovine spermatozoa. To achieve this, sperm cells were preincubated with apical membranes isolated from oviduct epithelial cells, washed and then further incubated without the apical membranes. Sperm viability, motility, and acrosomal integrity were observed to be improved in the second incubation. Spermatozoa were also incubated with apical membranes labelled with methionine and proteins were separated through extensive wash by two-dimensional gel electrophoresis in order to identify the potential factors having beneficial effects on spermatozoa. Six major proteins were then extracted from another two-dimensional gel and processed to sequence the first 15 amino acids (AA). From these processed proteins, it was found that one was identical to heat shock protein 60 (HSP60) and one to the glucose-regulated protein (GRP78). The authors report the localization of these proteins on the luminal/apical surface of the oviduct epithelial cells, their binding to spermatozoa and the presence of endogenous HSP60 in the sperm midpiece in this article.

5 Luteolysis, onset of oestrus, and ovulation in Holstein heifers given prostaglandin F2alpha concurrent with, or 24 hours prior to, removal of an intervaginal, progesterone-releasing device

Researchers

Hittinger, M.A
Ambrose, J.D.
Kastelic, J.P.

Canadian Journal of Veterinary Research. 2004. Vol. 68, No. 4, p. 283-287.

In this study, the effects of giving prostaglandin F2alpha (PGF) concurrent with, or 24 hours before the removal of an intravaginal, progesterone-releasing (controlled internal drug released (CIDR)) device were determined. The effects of these treatments were evaluated on lutelolyis, the synchrony of oestrus and ovulation. Eighteen postpubertal Holstein heifers were treated with CIDR and gonadotropin-releasing hormone (GnRH) and assigned to one of three groups varying in the time that PGF was given. Time intervals from CIDR removal to the onset of the standing oestrus and ovulation were not different among the three groups. There were longer intervals from CIDR removal to oestrus and ovulation in heifers that were in metestrus at the time of CIDR insertion than those at oestrus or dioestrus but intervals from standing oestrus to ovulation were not different. Luteal regression, synchrony of oestrus and ovulation of cows that received PGF at the time of CIDR removal were not affected by the treatment.

Main Canadian Institution

Alberta Government
Agriculture, Food and Rural Development

6 Origin of bovine follicular fluid and its effect during in vitro maturation on the developmental competence of bovine oocytes

Researchers

Ali, A.
Coenen, K.
Bousquet, D.
Sirard, M.A.

Theriogenology. 2004. Vol. 62, No. 9, p. 1596-1606.

The purpose of this study was to evaluate the ability of different concentrations of bovine follicular fluid (bFF) to support in vitro maturation of oocytes and subsequent developmental capacity. The evaluated concentrations of bFF were 1%, 5%, and 10%. The bFF was derived from competent cells or from a pool of small follicles coming from abbatoir-derived ovaries. Oocytes reaching the blastocyst stage were more numerous when cultured with 5% bFF from competent follicles. The blastocyst production rate from these competent follicles was increased due to a synergy between estradiol and the recombinant human follicle-stimulating hormone. The inner cell mass and trophectoderm cell numbers indicated the quality of blastocysts for bFF from competent and small follicles respectively. It was concluded that the developmental competence of abbatoir-derived oocytes was increased by follicular fluid coming from competent follicles.

Main Canadian Institution

Université Laval

7 Ovarian and endocrine responses associated with the treatment of cystic ovarian follicles in dairy cows with gonadotropin releasing hormone and prostaglandin F2 alpha, with or without exogenous progesterone

Researchers

Ambrose, D.J.
Schmitt, E.J.P.
Lopes, F.L.
Mattos, R.C.
Thatcher, W.W.

Canadian Veterinary Journal. 2004. Vol. 45, No. 11, p. 931-937.

This research aimed to document ovarian and endocrine responses associated with the treatment of cystic ovarian follicles (COF) in dairy cows, using gonadotropin releasing hormone (GnRH) and prostaglandin F2 alpha (PGF) with or without exogenous progesterone. The study was also meant to evaluate pregnancy establishment following synchronization of ovulation along with timed insemination in cows diagnosed with COF. Two trials were conducted. The first consisted of administering cows diagnosed with COF two injections of GnRH nine days apart with PGF given seven days after the first GnRH treatment. These cows were then inseminated 16 hours after the second injection of GnRH. All cows treated developed a new follicle after the first GnRH injection. Most of them ovulated after the second injection. Seven cows out of 17 were confirmed pregnant after a pregnancy diagnosis. The second trial consisted of administering GnRH and an intravaginal progesterone device (CIDR). Seven days following the treatment, these cows were given PGF and two days later, the CIDR was removed. It was found that plasma estradiol concentrations decreased after the CIDR insertion. All cows developed a new follicle after being treated with GnRH and almost all cows ovulated the new follicle. After CIDR removal, estradiol-surge and oestrus occurred spontaneously. It was concluded that the administration of GnRH followed with PGF seven days later resulted in the development of a new follicle in cows diagnosed with COF. The synchronization of ovulation and timed insemination resulted in a 41% pregnancy rate.

Main Canadian Institution

Alberta Government
Agriculture, Food and Rural Development

8 Pregnancy and bovine somatotropin in non-lactating dairy cows: II. Endometrial gene expression related to maintenance of pregnancy

Researchers

Guzeloglu, A.
Bilby, T.R.
Meikle, A.
Kamimura, S.
Kowalski, A.
Michel, F.
MacLaren, L.A.
Thatcher, W.W.

Journal of Dairy Science. 2004. Vol. 87, No. 10, p. 3268-3279.

The purpose of this study was to assess the effects of pregnancy and bST, particularly on endometrial gene and protein expression related to the maintenance of pregnancy in non-lactating cows at Day 17. It was found that bST treatment increased the steady state concentration of the oxytocin receptor (OTR) mRNA and the steady state concentration of the progesterone receptor (PR) mRNA along with the PGHS-2 protein whereas it decreased the PR abundance in the stromal layer of the endometrium. Pregnancy alone also had some effects. It decreased the abundance in estradiol receptor alpha (ERalpha) mRNA, while the latter was bST stimulated. Pregnancy also increased the PGHS-2 protein, which was found only in the luminal epithelium cells of the endometrium, the PR protein in epithelial cells and the uterine glands. During pregnancy, the bST treatment resulted in a decreased ERalpha mRNA and in a lower PR protein response, which was not the case for non-treated pregnant cows. The authors concluded that different mRNA and protein responses were identified between control and pregnant cows related to prostaglandin biosynthesis. Furthermore, changes induced by the bST treatment may have some impact on the mechanisms associated with the maintenance of pregnancy in non-lactating cows.

Main Canadian Institution

Nova Scotia Agricultural College

9 Development of in vitro tests to predict fertility of bulls

Researchers

Giritharan, G.
Ramakrishnappa, N.
Balendran, A.
Cheng, K.M.
Rajamahendran, R.

Canadian Journal of Animal Science. 2005. Vol. 85, No. 1, p. 47-52.

The purpose of this study was to develop an in vitro test to predict the fertility of bulls in the field. To achieve this, the authors investigated the bull effect on in vitro embryo production, zona binding and acrosome reaction, as well as the correlation between this effect and field fertility, which was measured on a 60- to 90-days non-return rate. They used frozen semen, which was thawed and pooled. Motile sperm was selected and its acrosome status was assessed. Cleavage and blastocyst production rates were also assessed and the number of sperm bound to the zona pellucida of mature oocytes was determined. The percentage of acrosome-reacted sperm at 4 hours was increased, compared to what was measured at 0 hour. Sperm-zona binding rates were different among sperm samples from young bulls. Negative correlations were found between acrosome-reacted sperm at 0 hours and sperm-zona binding rates and cleavage rate, while positive correlations were observed between acrosome-reacted sperm at 4 hours, sperm-zona binding rates, and cleavage rate. The authors concluded that a combination of in vitro tests, which includes the percentage of spontaneously acrosome reacted sperm at thawing, along with pre-freeze motility, can be useful in predicting bull field fertility. Nevertheless, the combination of assays has yet to be determined.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

10 Effect of a single administration of cephapirin or cloprostenol on the reproductive performance of dairy cows with subclinical endometritis

Researchers

Kasimanickam, R.
Duffield, T.F.
Foster, R.A.
Gartley, C.J.
Leslie, K.E.
Walton, J.S.
Johnson, W.H.

Main Canadian Institution

UNIVERSITY of GUELPH

Theriogenology. 2005. Vol. 63, No. 3, p. 818-830.

The purpose of this study was to evaluate the effect of a single administration of cephapirin iu or cloprostenol im on the reproductive performance of dairy cows with subclinical endometritis. Cows in early lactation, determined normal for clinical endometritis, were subjected to a reproductive examination, which includes rectal palpation, ultrasonography (US) and endometrical cytology (EC). Cows received one of three treatments: no treatment (control), benzathine cephapirin iu or cloprostenol im. They were monitored for their reproductive performance during eight months following the treatments. Results showed there was an increase in the relative pregnancy rate of cows with subclinical endometritis after the administration of either cephapirin iu or cloprostenol im in comparison with control cows. It was concluded that administering cephapirin iu or cloprostenol im in early lactation (between 20 to 33 days in milk) improved the reproductive performance of cows affected by subclinical endometritis.

11 Effect of presynchronization using prostaglandin F2 alpha and a milk-ejection test on pregnancy rate after the timed artificial insemination protocol, OVSYNCH

Researchers

Keith, B.R.
Leslie, K.E.
Johnson, W.H.
Walton, J.S.

Main Canadian Institution

UNIVERSITY of GUELPH

Theriogenology. 2005. Vol. 63, No. 3, p. 722-738.

This study aimed to evaluate if PGF2 alpha –induced milk letdown (ML) is a precise indicator of luteolysis allowing cows to be synchronized to begin the OVSYNCH protocol at the best time in the oestrus cycle. It also aimed to assess eventual improvement in the pregnancy rate (PR). To perform the study, lactating cows between 55 and 70 days in milk were used. It was found that cows treated with PROSYNCH had pregnancy rates of 48% and those treated with OVSYNCH had pregnancy rates of 52%. When data from both groups were combined, PR was greater in cows that started the OVSYNCH protocol in stage 2. However, cows treated with PROSYNCH showed a greater proportion of ovulation after GnRH#1, luteolysis after PGF2 alpha and ovulation after GnRH#2. It was also found that luteolysis was indicated by the ML test with a good enough accuracy to time initiating the OVSYNCH treatment. This initiation time is between days 5 and 9 of the cycle. The authors concluded that using the OVSYNCH protocol and initiating it in the period between days 5 and 9 of the cycle enhanced a greater pregnancy rate and improved the efficacy of each injection.

12 Effects of serum and cumulus cell expansion on marker gene transcripts in bovine cumulus-oocyte complexes during maturation in vitro

Researchers

Calder, M.D.
Caveney, A.N.
Sirard, M.A.
Watson, A.J.

Main Canadian Institution

Fertility and Sterility. 2005. Vol. 83, p. 1077-1085.

The purpose of this study was to evaluate the distribution of transcripts encoding FSH receptor (FSHr), LH receptor (LHr), connexin 43 (Cx43), cyclooxygenase-2 (COX-2) and prostaglandin E-2 receptors 2 and 3 (EP2 and EP3) within bovine cumulus-oocyte complexes (COC) and denuded oocytes. The research also aimed to assess the influence of gonadotropins, serum and cumulus cell expansion as regards the abundance of transcripts encoding these genes. COC were treated in culture with serum and gonadotropin-supplemented media to look at the effects on mRNA transcript. It was found that LHr, FSHr and EP3 mRNAs were detected in intact COC, while Cx43, COX-2 and EP2 mRNAs were identified in COC and in oocytes. There was a decrease in the expression of all mRNAs except for LHr due to the presence of serum in maturation media, which suggests that this one altered the relative abundance of COC mRNAs.

13 Expression of Cyclin B1 messenger RNA isoforms and initiation of cytoplasmic polyadenylation in the bovine oocyte

Researchers

Tremblay, K.
Vigneault, C.
McGraw, S.
Sirard, M.A.

Main Canadian Institution

UNIVERSITÉ LAVAL

Biology of Reproduction. 2005. Vol. 72, No. 4, p. 1037-1044.

In other species, oocyte cyclin B1 mRNA goes through cytoplasmic polyadenylation/translation during the in vitro maturation. The object of this study was to assess if the same applies to bovines. Cyclin B1 mRNA was present in two isoforms with different 3'-UTR lengths. Only the longer one has a putative cytoplasmic polyadenylation element (CPE) sequence and other regulatory sequences. It was observed that in germinal vesicle-stage oocytes, the cyclin B1L bears a quite long poly (A) tail, which becomes even longer before metaphase I. However, when the ovaries and the oocytes are transported and manipulated on ice to stop the polyadenylation process, the cyclin bears a short poly (A) tail. The cytoplasmic polyadenylation probably occurs during the ovary transport in warm saline when oocytes are still in their follicular environment. It was shown that there was a link between cytoplasmic polyadenylation of cyclin B1 and translation/appearance of cyclin B1 protein before in vitro maturation.

14 GnRH in non-hypothalamic reproductive tissues

Researchers

Ramakrishnappa, N.
Rajamahendran, R.
Lin, Y.M.
Leung, P.C.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

Animal Reproduction Science. 2005. Vol. 88, No. 1-2, p. 95-113.

GnRH is essential to mammalian reproduction. That hormone, such as its analogues, is often used for the treatment of hormone-dependant diseases and in assisted reproductive technology. There are different forms of GnRH just like there are some structural variants of it. Three different forms and 14 structural variants have yet to be recognized. The main source and target sites of GnRH are the hypothalamus and pituitary but extra-hypothalamic GnRH and GnRH receptors have been found in many reproductive tissues. Recent studies demonstrated these were more abundant in ovarian, endometrial and prostate carcinomas. The presence of GnRH-II in some reproductive tissues suggests that it may play distinct roles in these tissues. GnRH-II is mainly expressed in extra pituitary reproductive tissues were it produces its effects by PLC-, PKA2-, PLD- and AC-signalling pathways. In these tissues, GnRH is considered to act in an autocrine or paracrine manner and to regulate ovarian steroidogenesis. GnRH was also found to cause a stimulatory effect on basal steroidogenesis, as well as an inhibitory effect on gonadotropin-stimulated androgen biosynthesis in male gonads. Since GnRH exists under different forms, it indicates the presence of distinctive cognate receptor types in vertebrates and this can contribute to the development of new analogues of GnRH having a highly selective and controlled action on different reproductive tissues.

15 Inhibition of bovine sperm-zona binding by bovine herpesvirus-1

Researchers

Tanghe, S.
Vanroose, G.
Van Soom, A.
Duchateau, L.
Ysebaert, M.T.
Kerkhofs, P.
Thiry, E.
Van Drunen Little-van den Hurk, S.
Van Oostveldt, P.
Nauwynck, H.

Main Canadian Institution

University of Saskatchewan

VIDO

Reproduction 2005. Vol. 130, No. 2, p. 251-259.

The aim of this research was to identify a potential interference of bovine herpesvirus-1 (BoHV-1) with sperm oocyte interactions during bovine in vitro fertilization. Sperm-zona binding was inhibited at almost 70% and that was mediated through a virus-spermatozoa interaction. It was observed that the BoHV-1 antiserum prevented the virus-induced inhibition of the sperm-zona binding, which indicates that the fertilization process is affected by the BoHV-1 itself. In order to find out which glycoprotein(s) are responsible for the virus-sperm interaction, the virus was treated with monoclonal antibodies against four glycoproteins (gB, gC, gD and gH) before insemination. It was found that the inhibitory effect was completely prevented by anti-gC whereas anti-gD enhanced a decrease of that inhibition. Sperm-zona binding was also decreased by purified gC and gD, with gC being more effective than gD. That finding further showed the involvement of gC and gD in the virus-sperm interaction and it indicates that the virus inhibits the bovine sperm-zona binding through its interaction with spermatozoa. Viral glycoproteins gC and gD mediated the binding of BoHV-1 to a spermatozoon and this seems to be similar to the attachment mechanisms of BoHV-1 to its natural host.

16 Isolation and characterization of glycosaminoglycans from bovine follicular fluids and their effect on sperm capacitation

Researchers

Therien, I.
Bergeron, A.
Bousquet, D.
Manjunath, P.

Main Canadian Institution

Université de Montréal

Molecular Reproduction and Development. 2005. Vol. 71, No. 1, p. 97-106.

This study aimed to purify large amounts of glycosaminoglycans (GAG) from bovine follicular fluid (bFF), so as to characterize them. It also aimed to determine their potential in capacitating sperm as a potential alternative to heparin, which is not present in genital tract fluids of the female. In order to determine their potential to capacitate sperm, heparan sulfate and chondroitin sulfate B, which are two GAG present in FF, were isolated, then purified. None of these treatments stimulated the sperm acrosome reaction, but both FF-GAG and heparin stimulated sperm capacitation. Heparan sulphate was more active to promote sperm capacitation than chondroitin sulphate B, even though chondroitin sulphate B stimulated twice more sperm capacitation than the control. It was also found that increasing the fraction of heparan sulphate did not alter the sperm capacitation. A strong interaction between FF-GAG with bovine seminal plasma (BSP) proteins was shown. It was concluded that the most effective GAG for sperm capacitation present in FF was the heparan sulfate.

17 Progesterone (CIDR)-based time AI protocols using GnRH, porcine LH or estradiol cypionate for dairy heifers: Ovarian and endocrine responses and pregnancy rates

Researchers

Ambrose, J.D.
Kastelic, J.P.
Rajamahendran, R.
Aali, M.
Dinn, N.

Theriogenology. 2005. Vol. 64, No. 7, p. 1457-1474.

The purpose of this study was to compare the efficiency of GnRH, porcine LH (pLH) and estradiol cypionate (ECP) in a modified OVSYNCH/fixed-time AI (FTAI) protocol. This protocol included a controlled internal drug (progesterone) release (CIDR) device for 8 days. The first experiment consisted of giving a CIDR on Day 10 to heifers followed with a PGF treatment on Day 3. The heifers were also given a dose of saline GnRH, ECP or 5 mg pLH at CIDR insertion and repeated on Day 1, save ECP, which was repeated on Day 2, when the CIDR was removed. A longer interval to ovulation was observed with the administration of 5 mg pLH and the mean peak of LH concentration was also lower in heifers receiving 5 mg pLH. In the second experiment, heifers treated with the CIDR-based OVSYNCH protocols received either a low dose of 12.5 pLH, a high dose of 25 mg pLH, or GnRH. Higher plasma concentrations of LH were observed for heifers treated with the higher pLH dose than for the ones treated with GnRH. Fifteen of the 17 heifers ovulated. Progesterone concentrations were higher for heifers treated with the higher dose of LH on days 9 and 14, which could mean that they had an enhanced CL function. The last experiment consisted of a treatment with CIDR-based OVSYNCH/FTAI protocols in 240 heifers. These heifers were treated with either GnRH/GnRH, ECP/ECP, pLH/pLH or GnRH/ECP. Pregnancy rates were higher for ECP/ECP and lower for GnRH/ECP, the two other treatments resulting in intermediate pregnancy rates. The authors concluded that heifers treated with CIDR-based OVSYNCH/FTAI protocols with either GnRH/GnRH or ECP/ECP produced higher pregnancy rates than that reported for heifers treated to OVSYNCH/FTAI in the absence of CIDR.

Main Canadian Institution

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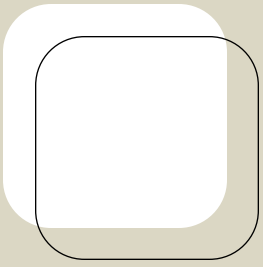
Index of digests



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1 Effects of water source, dilution, storage and bacterial and faecal loads on the efficacy of electrolyzed oxidizing water for the control of *Escherichia coli*
2 Molecular typing and distribution of *Staphylococcus aureus* isolates in eastern Canadian dairy heifers
3 Immune responses to a DNA/protein vaccination strategy against *Staphylococcus aureus*-induced mastitis in dairy cows
4 Impacts of early lactation somatic cell count in heifers on somatic cell counts over the first lactation
5 Prevalence of paratuberculosis in culled dairy cows in Atlantic Canada and Maine
6 Certification of herds as free of *Mycobacterium paratuberculosis* infection: actual pooled faecal results versus certification model predictions
7 Development of *Pichia pastoris* as a rumen escape vehicle for the intestinal delivery of recombinant proteins in ruminants
8 D-lactate production and excretion in diarrhoeic calves
9 Endometrical cytology and ultrasonography for the detection of subclinical endometritis in postpartum dairy cows
10 Evaluation of a treatment protocol for intramammary infections in early postpartum dairy cows based on a positive California mastitis test result
11 Expression profiles of p53 and p66shc during oxidative stress-induced senescence in foetal bovine fibroblasts
12 In vitro growth inhibition of major mastitis pathogens by *Staphylococcus chromogenes* originating from teat apices of dairy heifers
13 Lack of effect of 10 kV/m 60 Hz electric field exposure on pregnant dairy heifer hormones
14 *Lactobacillus rhamnosus* strain GG is a potential probiotic for calves
15 Milk antibodies against *Ostertagia ostertagi*: Relationships with milk IgG and production parameters in lactating dairy cattle
16 Peripartum serum vitamin E, retinol and beta-carotene in dairy cattle and their associations with disease
17 Selenium status of dairy herds in Prince Edward Island
18 Udder health in dairy cattle infected with *Neospora caninum*

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19 Proteases involved in mammary tissue damage during endotoxin-induced mastitis in dairy cows
20 Association between somatic cell count in early lactation and culling of dairy heifers using Cox frailty models
21 Effect of Eprinomectin treatment at calving on milk production in dairy herds with limited outdoor exposure
22 Impacts of early lactation somatic cell count in heifers on milk yield over the first lactation
23 Effects of seropositivity for bovine leukemia, bovine viral diarrhoea virus, *Mycobacterium avium* subsp paratuberculosis and *Neospora caninum* on culling dairy cattle in four Canadian provinces
24 Comparison of two enzyme-linked immunosorbent assays for diagnosis of *Mycobacterium avium* subsp paratuberculosis
25 Evaluation of three ELISAs for *Mycobacterium avium* subsp. paratuberculosis using tissue and faecal culture as comparison standards
26 Associations between somatic cell count patterns and the incidence of clinical mastitis
27 Comparison of the cytobrush and uterine lavage techniques to evaluate endometrical cytology in clinically normal postpartum dairy cows
28 Determination of *Mycoplasma bovis* susceptibilities against six antimicrobial agents using the E test method
29 Effect of halofuginone lactate on the occurrence of *Crystosporidium parvum* and growth of neonatal dairy calves
30 Effect of paratuberculosis on culling, milk production and milk quality in dairy herds
31 Effect of stress on viral-bacterial synergy in bovine respiratory disease: novel mechanisms to regulate inflammation
32 Effect of trivalent vaccine against *Staphylococcus aureus* mastitis lymphocyte subpopulations, antibody production and neutrophil phagocytosis
33 Effects of monensin on meal frequency during sub-acute ruminal acidosis in dairy cows
34 Efficacy of an iodophore teat disinfectant against *Staphylococcus aureus* and *Streptococcus agalactiae* in experimental challenge
35 Efficacy of saponin-adjuvanted inactivated respiratory syncytial virus vaccine in calves
36 Efficacy of several serological tests and antigens for diagnosis of bovine brucellosis in the presence of false-positive serological results due to *Yersinia enterocolitica* O :9
37 Evaluation of bovine cutaneous delayed-type hypersensitivity to various test antigens and a mitogen using several adjuvants
38 Evaluation of enzyme-linked immunosorbent assays performed on milk and serum samples for detection of paratuberculosis in lactating dairy cows

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