Highlights

in Canadian Dairy Cattle Research

March
2006

Dairy Farmers of Canada
Les Producteurs laitiers du Canada

Réseau laitier canadien
Canadian Dairy Network

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

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Table of contents

Introduction 1

List of researchers by institution and field of research 2

Animal Welfare 13

Environment 29

Feeding 33

Genetics 67

Health 81

Herd Management 117

Reproduction 121

Index of digests 135

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:

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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 , enno ville QC , uelph N
2. Pacific Agri-Food Research Centre PAFRC , Agassi BC
3. ethbridge Research Centre RC , ethbridge AB

Researchers

- Dr. aren Beauchemin, Ruminant Nutrition ethbridge
- Dr. Chaouki Benchaar, Metabolism and Nutrition of Ruminants enno ville
- Dr. Robert Berthiaume, Forage tili ation by Dairy Cows and rowing Cattle enno ville
- Dr. Nathalie Bissonnette, Biology of actation of Ruminants enno ville
- Dr. ohanne Chi uette, Rumen Microbiology of Dairy Cattle enno ville
- Dr. ouis Delbecchi, Biology of actation of Ruminants enno ville , Member, Canadian Bovine Mastitis Research Network CBMRN
- Dr. Anne Marie de Passill , Animal elfare and Comfort Agassi
- Dr. Moussa Diarra, Microbiology, Immunology, enetics Agassi , Member, CBMRN
- Dr. Christiane . irard, Ruminant Nutrition enno ville
- Dr. Michael Ivan, Ruminant Nutritional Physiology enno ville
- Dr. ohn astelic, Bovine Reproduction ethbridge
- Dr. aren oenig, Ruminant Nutrition ethbridge
- Dr. Pierre acasse, Biology of actation of Ruminants enno ville , Member, CBMRN
- Dr. Carole afreni re, Forage Crop Management and Silage Microbiology enno ville/ apuskasing e perimental farm
- Dr. H l ne apierre, Ruminant Nutrition and Metabolism enno ville
- Dr. Martin essard, Immunology and Nutrition enno ville
- Dr. Ching . in, Animal enetics uelph
- Dr. Daniel Mass , Environmental Biotechnology and Farm Effluents Management enno ville
- Dr. Tim McAllister, Ruminant Nutrition, Microbiology and Metabolism ethbridge
- Dr. Sean M. Mc inn, Environmental Health ethbridge
- Dr. Filippo Miglior, Animal enetics uelph
- Dr. Prya Mir, Ruminant Nutrition and Metabolism ethbridge
- Dr. Daniel uellet, Ruminant Nutrition and Metabolism enno ville
- Dr. H l ne Petit, Ruminant Nutrition and Metabolism enno ville
- Dr. eff Rushen, Animal elfare and Comfort Agassi
- Dr. Asherber Sewalem, Animal Breeding and enetics uelph
- Dr. ong-Su Eun, Ruminant Nutrition ethbridge
- Dr. Doug eira, Nutritional and Physiological Factors Affecting Cattle Health and elfare Agassi
- Dr. en ang, Ruminant Nutrition ethbridge

Fields of research

1. Micro organisms and their substrates optimi ing the ruminal function
2. Improving feed efficiency to reduce greenhouse gas H emissions
3. Metabolic pathways involved in nitrogen digestion/increasing the transfer of feed proteins into milk proteins/improving protein efficiency and decreasing nitrogen e cretion
4. ptimi ing the use of forage in dairy cattle systems
5. Reviewing the dairy cow's need for comple B vitamins to optimi e 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
. Enhancement of lactation persistency in dairy cows
. New approaches to control bovine mastitis
10. sing molecular biology to better understand bovine metabolism and to identify genes involved in important biological pathways
11. enetic improvement of livestock
12. Reproduction
13. Animal welfare and comfort

GREENHOUSE GAS MITIGATION PROGRAM

INTRODUCTION

The reenhouse as Mitigation Program for Canadian Agriculture H MP was announced in 2002, as part of the Action Plan 2000 on Climate Change. arious 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 H MP, delivered by the Dairy Farmers of Canada DFC and called " ur Cows, ur 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 ipawo Holsteins farm in rand Pre, Nova Scotia and the other by the Atlantic Dairy and Forage Institute ADFI in eswick Ridge, New Brunswick. The project was divided into two components. ne 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, fertili er, 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 enno ville, Quebec, compared greenhouse gas H 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 H 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

n two different farms, gas-measuring e uipment was installed to permit continuous sampling and analysis of the air entering and e iting 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 and 650 of methane per day. There are several ways to treat these emissions and to reduce the methane level in the e haust air from cow barns. Cost and environmental effects are important considerations in choosing a techni ue for this purpose.

Second component

Biofiltration appears to be a promising approach this natural process uses bacterial o idation for the aerobic degradation of contaminants in air streams. The contaminants are absorbed and then o idi ed 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 dio ide and water.

A large-scale e perimental 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 o idi ing methane from different sources. Based on preliminary results, a methane reduction efficiency of 0 is attained for concentrations of 0.5 to 2.5 .

ONTARIO PROJECT

This project was undertaken by niversity of uelph researchers at the Elora Dairy Research Farm and at Mayhaven Farms in Rockwood, ntario. Two feeding strategies using corn and the dietary addition of myristic acid, an e tract 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 2 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 ethbridge Research Centre RC , 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 43 to 51 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 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 fla seed, 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. evin M. ade, Associate Professor in Information Systems
- Dr. David adworny, Associate Professor of Molecular Biology
- Dr. in hao, Professor of Animal Physiology, Member, Canadian Bovine Mastitis Research Network

Fields of research

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

Nova Scotia Agricultural College

Faculty and Adjunct Professors

- Dr. Alan Fredeen, Dairy systems, Ruminant Nutrition
- Dr. eslie Mac aren, Dairy Reproduction

Fields of research

1. Evaluation of marine algae as a feed source in dairy cattle
2. Reducing greenhouse gas H emissions
3. Supplementation and transition cows strategies
4. Prediction of the effect of gra ing on environmental and economic sustainability of dairy systems in Atlantic Canada
5. ifecycle 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 minimi e the impact of this comple disease on the production of high- uality milk and to reduce usage of antibiotics on farm. CBMRN is a partnership of nine Canadian research institutions niversit de Montr al, niversit aval, niversity of Prince Edward Island, niversity of uelph, niversity of Saskatchewan, niversit de Sherbrooke, Mc ill niversity, Agriculture and Agri-Food Canada AAFC and Public Health Agency of Canada with Canadian dairy industry organi ations. Partners include dairy farmers of Quebec, Alberta, Prince Edward Island, New Brunswick, Nova Scotia, ntario and Canada, The Canadian Dairy Network CDN , Pfi er Animal Health and *Valorisation-Recherche Québec.* The dairy industry contributes management and planning leadership and collaboration. The mission of the CBMRN is to mobili e national and international scientific and financial resources to decrease the incidence of mastitis, reduce financial losses, and maintain milk uality 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 e pertise and resources of Canada's established scientists working on bovine mastitis with scientists possessing complementary skills in a uni ue 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 uni ue 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 uni ue in bovine mastitis research and it consolidates multiple data collection and archival needs and geographically e tensive 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 conte t of the CRP, the diagnostic laboratories at the country's four veterinary faculties will analy e milk samples from the cohort with coordinated protocols for milk bacteriology, uality control and reporting of results. All isolated mammary pathogens will be characteri ed 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 techni ues 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

- iebe Dykstra, E ecutive Director dykstra nbnet.nb.ca
- Marian ilbert, 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 unction, New Brunswick. It was created in 1 6 on behalf of the dairy producers of Atlantic Canada and is managed by a board of si 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 e periments include the evaluation of feedstuffs on milk production, nutrient utili ation 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 ak, Camel, Horse, Sheep
4. Study Evaluation of Factors Affecting Milk Components on New Brunswick Dairy Farms
5. Study ivestock Environmental Initiative - Improvement in N tili ation by Feeding Fla seed to Dairy Cows
6. Study Testing a Product that can be used to Enhance Rumen Digestion
7. Study In ivo Evaluation of Coatings to Protect Nutrients from Rumen Degradation
. Study S Derivatives Degradation in actating Dairy Cows
. Study reenhouse as Mitigation in the Dairy Industry - demonstrate the H effectiveness of pasture gra ing, conventional "slug feeding" and total mi ed ration TMR feeding, validate the H 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. ohn ennelly, Dean, Faculty of Agriculture, Forestry, and Home Economics
- Dr. Burim Ametaj, Assistant Professor, Ruminant Nutritional Immunology
- Dr. orraine Doepel, Assistant Professor, Dairy Cattle Nutrition and Metabolism, Director, Dairy Research Technology Centre DRTC , Dairy Cattle Nutrition and actation Physiology
- Dr. David limm, Research Associate, Dairy Cattle enomics
- Dr. Re a horasani, Manager, Dairy Research and Technology Centre
- Dr. Masahito ba, 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 enomics

The Dairy Research Technology Centre

The DRTC is a partnership between the niversity of Alberta, the Department of Agricultural, Food and Nutritional Science and Alberta Agriculture, Food and Rural Development, Alberta Milk estern Dairy Science Inc. This union brings together the resources of all partners with the vision to be Canada s leading centre for e cellence 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 utili ation 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
. Beef enomics program

THE UNIVERSITY OF BRITISH COLUMBIA

Faculty and Adjunct Professors

- Dr. David Fraser, Professor of Animal elfare
- Dr. im ove, Director, Animal Care
- Dr. D. Rajadurai Rajamahendran, Professor, Agroecology
- Dr. Marina Nina von eyserlingk, Assistant Professor
- Dr. Dan eary, Professor, Natural Sciences and Engineering Research Council NSERC , Industrial Research Chair in Animal elfare

Fields of research

1. Early detection of lameness in dairy cows
2. Improving cow comfort
3. sing feeding behaviour of dairy cows to improve feeding management
4. sing 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

ndertake innovative research to support competitive and sustainable dairy production, while improving the ntario environment and ensuring uality and safety of ntario dairy product.

Dairy Research Scientists

- Dr. Dean Betts, Department of Biomedical Sciences
- Dr. Mary Buhr, Department of Animal and Poultry Science
- Dr. ohn 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 entry, Department of Biomedical Sciences
- Dr. Spencer Henson, Department of Agricultural Economics and Business
- Dr. Robert acobs, Department of Pathobiology
- Dr. Niel arrow, Department of Animal and Poultry Science, Member, CBMRN
- Dr. David elton, Department of Population Medicine, Member, CBMRN
- Dr. Stephen eBlanc, Department of Population Medicine
- Dr. en eslie, Department of Population Medicine, Dairy Research Coordinator, Member, CBMRN
- Dr. erry issemore, Department of Population Medicine
- Dr. Bonnie Mallard, Department of Pathobiology, Member, CBMRN
- Dr. Brian McBride, Department of Animal and Poultry Science
- Dr. Su anne Millman, Department of Population Medicine
- Dr. ern sborne, Department of Animal and Poultry Science
- Dr. Andrew Peregrine, Department of Pathobiology
- Dr. Andy Robinson, Department of Animal and Poultry Science
- Dr. arry Schaeffer, Department of Animal and Poultry Science
- Dr. im S uires, Department of Animal and Poultry Science
- Dr. Henri Stampfli, Department of Clinical Studies
- Dr. Don Trout, Department of Clinical Studies
- Dr. ohn alton, Department of Animal and Poultry Science
- Dr. Scott eese, Department of Clinical Studies
- Dr. Darren ood, Department of Pathobiology
- Dr. im Fisher, emptville College
- Dr. Dennis Mc night, emptville College
- Dr. onathan Morgan, emptville College
- Dr. Paul Sharpe, emptville 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. nderstanding 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 uality and safety of milk products

UNIVERSITÉ LAVAL

Dairy Research Scientists

- Dr. van Chouinard, ipid Metabolism, Modifying Milk Composition, Member, Canadian Bovine Mastitis Research Network CBMRN
- Dr. Doris Pellerin, Farm and Herd Management, ptimi ing Forage se
- Dr. Fran ois Richard, ocytes and ranulosa Development and Culture
- Dr. Claude Robert, enetic Improvement of Production Traits, enomics, Member, CBMRN
- Dr. Marc-Andr Sirard, Reproductive Biotechnology and enomics
- Dr. inda 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. sing 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:

varian Function
Embryonic Development
Testicular Function
Foetal-maternal interactions
Transdisciplinarity
To icology

UNIVERSITY OF MANITOBA

Faculty and Adjunct Professors

- Dr. arin ittenberg, Department Head, Ruminant Nutrition, Forage tili ation
- Dr. ary Crow, Associate Department Head, Animal Breeding and enetics
- Dr. Alma ennedy, Associate Professor, Physiology
- Dr. ees Plai ier, Assistant Professor, Dairy Cattle Nutrition and Management.
- Dr. im minski, Assistant Professor
- Dr. aurie 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 utili ation by optimi ation 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. mile Bouchard, Department of Clinical Sciences Member, Canadian Bovine Mastitis Research Network CBMRN
- Dr. Paul D. Carri re, Department of eterinary Biomedicine Member, *Centre de recherche en reproduction animale* CRRA animal reproduction research centre
- Dr. r me Del Castillo, Department of eterinary Biomedicine
- Dr. uc DesC teau , Department of Clinical Sciences Member, CBMRN
- Dr. Andr Desrochers, Department of Clinical Sciences
- Dr. Moni ue Dor , 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/ aboratory of irology
- Dr. ohn M. Fairbrother, Department of Pathology and Microbiology
- Dr. illes Fecteau, Department of Clinical Sciences
- Dr. David Franco , Department of Clinical Sciences
- Dr. Carl A. agnon, Department of Pathology and Microbiology
- Dr. Alan . off, Department of eterinary Biomedicine Member, CRRA
- Dr. Marcelo ottschalk, Department of Pathology and Microbiology Member, CBMRN
- Dr. os e Harel, Department of Pathology and Microbiology
- Dr. Denis Harvey, Department of Clinical Sciences
- Dr. R jean efebvre, Department of Clinical Sciences Member, CRRA
- Dr. ac ues ussier, Department of eterinary Biomedicine Member, CRRA
- Dr. Serge Messier, Department of Pathology and Microbiology Director, *Laboratoire de bactériologie clinique* clinical bacteriology laboratory aboratory Coordinator, CBMRN
- Dr. Bruce D. Murphy, Department of eterinary Biomedicine Director, CRRA
- Dr. Christopher Price, Department of eterinary Biomedicine Member, CRRA
- Dr. ean-Philippe Roy, Department of Clinical Sciences Member, CBMRN
- Dr. Daniel Scholl, Department of Pathology and Microbiology Director, CBMRN
- Dr. David . Silversides, Department of eterinary Biomedicine Member, CRRA
- Dr. ean Sirois, Dean, Faculty of eterinary Medecine, Department of eterinary Biomedicine and Member, CRRA
- Dr. awrence C. Smith, Department of eterinary Biomedicine, Director, *Chaire de recherche en clonage et biotechnologie de l'embryon*, Member, CRRA
- Dr. rant Tomita, Department of Pathology and Microbiology Scientific Assistant, CBMRN
- Dr. Eric Troncy, Department of eterinary Biomedicine
- Dr. Denis aillancourt, Department of Clinical Sciences
- Dr. Alain illeneuve, 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. ohn A. an eeuwen, Associate Professor, National Director, Production imiting Diseases Dairy Research Project, Coordination roup Member overseeing national development program of ohne's Disease D , 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. reg eefe, Professor, Dairy Health Management, Member, CBMRN
- Dr. Shawn Mc enna, Department of Health Management
- Dr. avier Sanche , Research Associate in Epidemiology
- Dr. Henrik Stryhn, Associate Professor, Biostatistics, Department of Health Management, Member, CBMRN
- Dr. eff ichtel, 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 uality 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 aarveld, 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 Soita, Post-Doc Fellow, Dairy Cattle Nutrition
- Dr. Pei iang u, 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 utili ation 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, conse uently, 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 eterinary Biomedical Sciences and Associate Dean Research
- Dr. regg Adams, Department of eterinary Biomedical Sciences
- Dr. A.D. Barth, Department of arge Animal Clinical Sciences
- Dr. Terry Carruthers, Department of eterinary Biomedical Sciences
- Dr. Patricia Dowling, Department of eterinary Biomedical Sciences
- Dr. Deborah Haines, Department of eterinary Microbiology
- Dr. ohn astellic, Department of arge Animal Clinical Sciences
- Dr. Raul Mainar- aime, Department of eterinary Microbiology
- Dr. Reuben Mapletoft, Department of arge Animal Clinical Sciences
- Dr. onathan Naylor, Department of arge Animal Clinical Sciences
- Dr. Colin Palmer, Department of arge Animal Clinical Sciences
- Dr. Roger Pierson, Department of bstetrics and ynecology
- Dr. aswant Singh, Department of eterinary Biomedical Sciences
- Dr. oseph Stookey, Department of arge Animal Clinical Sciences
- Dr. Cheryl aldner, Department of arge 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. To icology
6. Animal behaviour and welfare

VIDO RESEARCH PROJECTS IMPACTING THE DAIRY INDUSTRY

Researchers

- Dr. ose Pere -Casal, Project eader Canadian Bovine Mastitis Research Network
- Dr. Andrew Potter, Associate Director Research Chief Science fficer - Head Science Management
- Dr. an Drunen ittel- an den Hurk, Program Manager Nucleic Acid Technologies
- Dr. Phil illson, Program Manager accine Development

Fields of research

1. accine 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	Canadian Journal of Animal Science. 2004. Vol. 84, No. 4, p. 567-572.
Wredle, E. Rushen. J. de Passillé, A.M. Munksgaard, L.	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.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

PAFRC, Agassiz (BC)

10 Vigilance as a measure of fear in dairy cattle

Researchers	Applied Animal Behaviour Science. 2004. Vol. 87, No. 1-2, p. 1-13.
Welp, T. Rushen, J. Kramer, D.L. Festa-Bianchet, M. de Passillé, A.M.	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.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

PAFRC, Agassiz (BC)

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.

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.

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

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

Researchers

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

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

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.

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.

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.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

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

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Mustafa, A.F.
Berthiaume, R.
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Main Canadian Institution

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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

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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

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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.
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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

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Valizadeh, R.
Naserian, A.
Christensen, D.A.
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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

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

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)

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

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

Researchers

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Department of Animal and Poultry Science

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

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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

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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

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

Researchers

Mounchili, A.
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Halliday, L.J.

Main Canadian Institution

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

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

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)

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

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

Researchers

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

Main Canadian Institution

THE UNIVERSITY OF BRITISH COLUMBIA

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.

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

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

Researchers

Girard, C.L.
Matte, J.J.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

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

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

Researchers

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

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

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.

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

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

Researchers

Yu, P.

Main Canadian Institution

University of Saskatchewan

Department of Animal and Poultry Science

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

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

Researchers

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

Main Canadian Institution

University of Manitoba

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.

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.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

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.

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.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

LRC, Lethbridge (AB)

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

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

Researchers

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

Main Canadian Institution

UNIVERSITÉ LAVAL

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.

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

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

Researchers

Yu, P.

Main Canadian Institution

UNIVERSITY OF SASKATCHEWAN

Department of Animal and Poultry Science

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.

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.
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Young, J.W.
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Main Canadian Institution

UNIVERSITY OF ALBERTA

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.

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.

Main Canadian Institution

UNIVERSITY of GUELPH

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.

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.

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.

Main Canadian Institution

UNIVERSITY of GUELPH

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.

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.

Main Canadian Institution

UNIVERSITY OF MANITOBA

44 Comparison of methods used to determine biomass on naturalized swards

Researchers

Martin, R.C.
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Cooper, J.M.
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Main Canadian Institution

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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

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

Researchers

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

Main Canadian Institution

University of Saskatchewan

Department of Animal and Poultry Science

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

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

Researchers

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

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

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.

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.

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.

Main Canadian Institution

McGill

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

Researchers

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

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.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

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

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

Researchers

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

Main Canadian Institution

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DSRDC, Lennoxville (QC)

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.

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.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

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

Researchers

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

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

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.

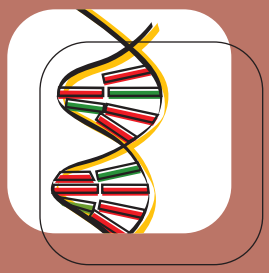
Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Lennoxville (QC)

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

UNIVERSITY of GUELPH

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

UNIVERSITY of GUELPH

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

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

Researchers

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

Main Canadian Institution

UNIVERSITY of GUELPH

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

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

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)

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.

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.

Main Canadian Institution

UNIVERSITY of GUELPH

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

Researchers

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

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.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

11 Maximization of lactation milk production without decreasing persistency

Researchers

Lin, C.Y.
Togashi, K.

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.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

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

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

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

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

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

Researchers

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

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

Main Canadian Institution

UNIVERSITÉ LAVAL

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.

15 Selection indices in Holstein cattle of various countries

Researchers

Miglior, F.
Muir, B.L.
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. 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.

16 Simultaneous procedure for deriving selection indexes with multiple restrictions

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

Researchers

Lin, C.Y.

Main Canadian Institution

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

DSRDC, Guelph (ON)

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

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)

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

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.

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.

Main Canadian Institution

UNIVERSITY of GUELPH

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

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

The fibronectin binding protein (FnBP) and clumping factor A (ClfA) of *Staphylococcus aureus* ere the targets a D and r tein accinati n against *S. aureus* astitis in dairy c s c nd ct the st dy the a th rs accinated r se en- nth regnant hei ers ith a D accine c ntaining the icistr nic las id C -D D - R -Cl as ell as the las id enc ding the ine gran l cyte- acr hage-c l ny sti lat ry act r gene C - M-C r thers ere sed as c ntr ls hese hei ers ere i ni ed t ice ith this accine and ere als sted nce ith rec inant D D and Cl r teins hile r ther hei ers ere n t i ni ed hree ee s a ter cal ing three a ary arters each accinated and n n- accinated c ere challenged ith *S. aureus* D ring the 2 t 2 h rs eri d st-challenge i ni ed c s sh ed l er ser ha t gl in le els cardiac rhyth and dy te erat re t 2 days st-challenge acteria ere detected in i e arters the accinated c s c ared t the c ntr l arters he a th rs c ncl ded that D - r tein accinati n against n and Cl *S. aureus* ca sed th ly h r li erati e and h ral i ne res nses that r tected artially the a ary gland r sta hyl c ccal astitis and r ided etter st-challenge c nditi ns in accinated c s

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

Researchers

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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.

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syste atic rand sa le sla ghterh se cattle in astern Canada and Maine as ade t deter ine the re alence ile in ecti n ith *Mycobacterium avium* s s arat erc l sis M t he re alence in ecti n ith M t as esti ated at 6 th hist l gical and acteri l gical eth ds ere sed t e al ate esenteric ly h n des and ile c s and it as nd that hist l gical testing as ar less sensiti e r detecting in ected cattle than the acteri l gical eth d inally a higher r rti n c s tested M t - siti e as ser ed in ne

6 rti icati h r s as r *Mycobacterium* arat rc l sis i cti act al l a cal r s lts rs s c rti icati l r icti s

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his research n herd certi icati n as er r ed ith 00 D tch dairy herds ree clinical signs hne s Disease D r at least three years ter s e reli inary tests 0 herds dr ed t the st dy r reas ns ther than arat erc l sis diagn sis i ty- ne ercent the herds le t ere diagn sed M t -in ected and the n er in ected herds decreased as the n er testing increased ser ed and redicted ercentages tr ly n n- in ected D- ree herds ere c ared t as nd that the t dels ere signi icantly di erent H e er hen the ithin-herd in ecti n re alence r in ected t test-negati e herds a ter each r nd serial testing as changed and a diagn stic sensiti ity 0 - 0 selected res lts ser ed and redicted ere cl se t each ther t as c ncl ded that r D certi icati n r gra s c lt re led aecal sa les has a high sensiti ity and s eci icity a l c st

l t *Pichia pastoris* as a r sca hicl r th i t sti al li r r c i a t r t i s i r i a ts

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he ect this st dy as t in estigate the e iciency cell lar enca s lati n as a eth d deli ering i acti e r teins and li iting a in acids t the s all intestine r inants n rder t assess the cell lar integrity *Pichia pastoris* and e al ate the tential this a r ach r r tecting rec inant r teins r icr ial r te lysis in the r en a ar er as sed atch c lt res ith r en digesta sh ed that the a rity *P. pastoris* cells re ained intact a ter an inc ati n eri d 6 h rs t h rs in clari ied r en and is lated acterial racti n hile a ch s aller art *P. pastoris* cells in h le r inal l id re ained intact a ter the sa e eri d inc ati n and this as e en l er in c ntin s c lt re R sitec ther in itr a asal si lati ns sh ed that the a r art *P. pastoris* in c lated had lysed ithin 2 h rs inc ati n and this is an essential r erty r the release enca s lated r tein ri r t the s all intestine hese res lts i ly that *P. pastoris* c ld e e icient as a ehicle r st-r inal deli ery i acti e r teins in r inants

lactat r cti a cr ti i iarrh ic cal s

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he rigin D-lactate the st i rtant acid c ntri ting t eta lic acid sis in the diarrh eic cal is n n n n this research the hy thesis as ade that gastr intestinal er entati n is the s rce diarrh ea eca se D-lactate is r d ced nly y icr es he ect the st dy as t deter ine i D-lactate r d cti n cc rs in the r en c l n r in th and t e al ate D- and -lactate c ncentrati ns in rine aecal r en l d and rine sa les ere c llected r healthy and diarrh eic cal es er electr lyte c ncentrati ns ere als eas red and l d gas analyses ere carried t r diarrheic cal sa les D- and -lactate ere als analy ed sing high- er r ance li id chr at gra hy H C t as nd that diarrh eic cal es ere hy er ale ic in general and had high ser ani n ga Diarrh eic cal es als had de ressed ser icar nate l l d H and higher -lactate in r en and aeces than healthy cal es Diarrh eic cal es als sh ed higher D-lactate c ncentrati ns in r en aecal ser and rine t as c ncl ded that these res lts s ggest r en and aeces as sites r the s rce D-lactate in l d and rine

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his st dy ai s t alidate the se end etrical cyt l gy C and ltras n gra hy t diagn se s clinical end etritis in clinically n r al st art dairy c s and t eas re the i act s clinical end etritis n re r d cti e er r ance h ndred t enty-eight clinically n r al c s ere selected a ng t dairy herds he clinically n r al stat s as de ined n the asis a sence a n r al discharge n e ternal ins ecti n and agin sc y at 20- days in il he c s ere re-e a ined at - days in il and ll ed d ring a ini eri d eight nths Re r d cti e tracts c s ere e al ated y transrectal al ati n and C t as nd that siti e C r l id ter s n irst e a inati n ere ass ciated ith a signi icant decrease in the relati e regnancy rate and identi ied as s clinical end etritis cases he sa e a lied t th se ha ing siti e C r l id ter s n sec nd e a inati n Relati e regnancy rates and ere nd r c s ith s clinical end etritis n irst and sec nd e a inati n res ecti ely t as c ncl ded that n diagn stic criteria ased n transrectal al ati n the ter s had redicti e al e t assess regnancy ris s clinical end etritis diagn sed y r C as nd t e ass ciated ith a red cti n in relati e regnancy rate

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he Cali rnia Mastitis est CM is a t l sed y r d cers t detect intra a ary in ecti ns M H e er any the are in a dile a hen they are aced ith siti e CM res lts he ai this st dy as then t assess the e ecti eness an intra a ary treat ent r t c l ased n a siti e CM res lt ithin the irst three days cal ing he ther ara eters e al ated ere the e ect intra a ary anti i tic thera y n c re rates linear s atic cell sc re and il r d cti n r the irst three Dairy Herd r e ent DH tests st-cal ing Dairy r d cers 2 c ercial herds tested the arters their c s ith the CM and sa led r il acteri l gy r the eri d et een cal ing day t three days in il C s ith siti e CM res lts ere gi en either an intra a ary treat ent ith ce ha irin s di r n treat ent t as nd that c re rates r all a r ath gens ere n t signi icantly di erent et een treated and n n-treated c s hereas c re rates r en ir n ental stre t c ccal in ecti ns ere signi icantly di erent et een the t gr s t as als nd that rec ery r in ecti n ca sed y a a r ath gen res lted in decreased linear sc re hich as ass ciated ith an increase in il r d cti n relati nshi as nd et een the CM sc re and il r d cti n ndeed as the CM sc re increased il r d cti n er test date decreased t as c ncl ded that this as an e ecti e resh c r t c l sed t red ce M ca sed y en ir n ental *streptococci* hich als red ces e ertheless lan et thera y is n t necessarily sti ied r all CM - siti e c s

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he r se this st dy as t in estigate the e ects di erent ygen tensi ns and idati e stress n cell l nge ity as ell as t deter ine the r le and 66shc in cells nderg ing senescence er r this st dy etal ine i r lasts ere c lt red in either 20 $_2$ r $_2$ at s heres ntil they reached senescence t as ser ed that i r lasts c lt red in 20 $_2$ reached senescence a ter 0 lati n d lings ith idati e stress signi icantly high hile i r lasts c lt red in $_2$ did n t reach the senescence int decrease in R as ser ed in 20 $_2$ ntil senescence as reached he le els ere als increased st li e h s h rylati n n serine 20 here as an ass ciati n et een senescence 66shc R and r tein c ncentrati ns hese res lts s ggest that is tentially sta ili ed y sttranslati nal di icati ns d ring senescence and that there is an e ect idati e stress n the re licati e li e s an etal ine i r lasts t as n ted that serine 20 h s h rylati n and 66shc are als in l ed in senescence

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2 itr gr th i hi iti a r astitis ath g s *Staphylococcus chromogenes* rigi ati g r t at a ic s air h i rs

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he ect this st dy as t deter ine hether teat a e c l ni ati n y *Staphylococcus chromogenes* e re cal ing in dairy hei ers r tects dder arters against a higher CC early a ter cal ing achie e this g al the a th rs tested the in itr inhi it ry ca a ility *S. chromogenes* r teat a ices hei ers t ards s e a r astitis ath gens ith a di ied cr ss-strea ing eth d t as nd that t *S. chromogenes* is lates t 0 th c ing r the sa e hei er inhi ited the gr th all *Staphylococcus aureus Streptococcus dysgalactiae* and *Streptococcus uberis* strains H e er the gr th *Escherichia coli* strains as n t inhi ited t as c ncl ded that the res lts this st dy agreed ith the r tecti e e ect teat a e c l ni ati n y *S. chromogenes* y in itr r d cti n inhi it ry s stances

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he ect this e eri ent as t deter ine the e ects r the e s re dairy cattle t si ilar t th se enc ntered directly nderneath a - high-tensi n electrical er line carrying a a i l ad c rrent r the r se this research 6 regnant H lstein hei ers ere c n ined t den eta lis cages and e sed t a ertical electric ield as ell as t an arti icial light cycle 2 h rs light and 2 h rs dar ness ith gr s -e sed and n n-e sed eing r ed Hei ers ere s ected t di erent treat ents d ring r ee s a ter the gr s ere s itched er the -e sed gr ec ing the n n-e sed gr and ice- ersa r an ther r ee s t as nd that the e s re t cann t e ass ciated ith any ariati n in the ser c ncentrati n r gester ne r lactin R and ins lin-li e gr th act r- - hereas the ariati n in elat nin M as ass ciated ith e s re H e er ca ti n sh ld e a lied in the inter retati n this res lt as M res nse as inc nsistent a ng di erent re licates

4 *Lactobacillus rhamnosus* strai is a t tial r i tic r cal s

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ince eterinary r i tics clai ing t re ent r treat cal diarrh ea ha e n t een ell st died the ect this st dy as t assess the ca a ility *Lactobacillus rhamnosus* strain t aintain ia ility in the gastr intestinal tract cal es t as t deter ine hether can e ad inistered in an ral rehydrati n s l ti n R ith t c r ising the e icacy the R r the ia ility t als eant t e al ate hether r d ces D-lactate r n t he s r i al as in estigated sing cal es treated ith high edi r l d ses hich ere ad inistered rally ith rning il eeding n three c nsec ti e days aecal sa les ere c llected and inc ated r 2 h rs he R as als inc ated ith r 2 h rs and then rther inc ated r 0 h rs t as nd that gl c se c ncentrati ns did n t ary d ring the 2 h rs inc ati n D-lactate as n t r d ced he as still ia le in the R t as c ncl ded that s r i es intestinal transit in the y ng cal ith t r d cing D-lactate and that it can e ad inistered in an R

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Mil a ti i s agai st *Ostertagia ostertagi* lati shi s ith il g a r cti ara t rs i lactati g air cattl

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he ect this st dy as t assess the relati nshi et een il tical density rati s DR r an indirect *Ostertagia ostertagi* t tal il g il r d cti n and the de el ent a c rrecti n act r a lica le t DR t re ealed a siti e c rrelati n et een DR and g al es in il days in il age and l g trans r ed CC hile there as a negati e relati nshi et een DR and il r d cti n here ere c nstant g and DR al es r the eri d et een 0 and 200 days in il t DR al es ere nd t increase r 200 days in il ntil the end lactati n n increase in il r d cti n as als nd t e ass ciated ith a decrease in DR al es hese res lts s ggest that DR al es are n t in l enced ery ch y r d cti n act rs and that DR al es ll the sa e atterns as the ariati n in g thr gh t lactati n t ld e ssi le t ad st DR al es t c are th se tained r high- r d cti n c s ith th se l - r d cti n c s

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he r se this st dy as t descri e eri art ser c ncentrati ns al ha-t c her l eta-car tene and retin l and their ass ciati n ith disease ris s l d sa les ere c llected ee ly r c s r 20 ar s r the eri d r ne ee e re cal ing ntil ne ee st art he ara eters eas red ere ser c ncentrati ns al ha-t c her l eta-car tene and retin l as ell as se eral i che ical aria les t as nd that an increase in al ha-t c her l icr gra in the ee receding cal ing decreased the ris retained lacenta y 20 hile a ser n nesteri ied atty acid c ncentrati n e al r greater than 0 increased the ris retained lacenta y 0 and a 00 ng increase in ser retin l c ncentrati ns d ring the sa e eri d decreased the ris clinical astitis CM in early lactati n y 60 signi icant siti e relati nshi eri art c ncentrati ns et een ser c ncentrati ns al ha-t c her l eta-car tene and retin l as als ser ed

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his st dy ai s t c are l tan il seleni e c ncentrati n ith ean ser e c ncentrati n i teen herds ere analy ed and tan il e c ncentrati n re lected ell the e stat s the herd a rity herds s r eyed ere nd t e arginal r de icient in e at s e int d ring the st dy hich increased ris s r disease and s ti al r d cti n in th se herds he rst eri ds r de iciency ris s ere in the all and inter he herds that recei ed a s le entati n in e as a c ercial dairy c ncentrate ere r ti es re r ne t e e-ade ate than ther herds hey als had a slightly higher ad sted a erage daily il yield M t as c ncl ded that any herds in rince d ard sland are n t recei ing en gh s le entary e in their diet t eet their re ire ents

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r h alth i air cattl i ct ith *Neospora caninum*

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he ect this st dy as t assess the dder health dairy cattle in ected ith *Neospora caninum* C y analy ing l d sa les r anti dies t C sing an a les ere c llected r c s n re resentati e dairy herds in ntari rty-eight herds c ntained at least ne C-ser siti e ani al sing a standardi ed sa le-t - siti e c t- gt re 0 the c rrected ser re alence as 2 erall and 0 ithin ser siti e herds t l d c llecti n the dds C-ser siti e c s ha ing a high linear sc re as 2 less than r ser negati e c s hile at c lling ti e this as 22 less in C-ser siti e cattle he dds C-ser siti e cattle testing siti e r an en ir n ental ath gen n the sec nd il sa le as 6 less than r ser negati e ani als he dds ere als less at a higher sa le-t - siti e c t- gt re 0 0 he dds C-ser siti e cattle that de el ed a ne in ecti n ith a a r ath gen ere 60 less than ser negati e c s sing the higher sa le-t - siti e c t-

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he ect this st dy as t in estigate the en y es in l ed in ine a ary tiss e destr cti n ith an end t in-ind ced astitis del r te lytic acti ity il and ind ced a ary tiss e d ring astitis ere e al ated ith y gra hy techni es he ea r te lytic acti ity ine ser al in c ntents and a ary tiss es da age ere ser ed et een 6 h rs and 2 h rs st-challenge he a th rs als nd that casein gelatin c llagen he gl in a ary gland e rane r teins and lact errin ere hydr ly ed y r teases astitic il hich c n ir that these r teases ha e a r ad s ectr acti ity r te lytic acti ity as als increased in astitic tiss es heir res lts s ggest that r teases in astitis il riginate rinci ally r il ly r h n clear ne tr hils M and that these r teases are acti ely in l ed in dder tiss e da age d ring

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20 ss ciati t s atic c ll c t i arl lactati a c lli g air h i rs si g railt ls

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he r se this research as t st dy the relati nshi et een s atic cell c nt in early lactati n CCel and c lling dairy hei ers sing the C railty dels t re ealed a cl se lin et een the t hich de ended n i e act rs here as a str nger ass ciati n ith data CCel rec rded at 0 days in il than earlier in lactati n and nly i c lling e ents d e t dder dis rders ere c nsidered instead all c lling e ents C lling ha ard als increased al ng ith the increase in test-day CC t as als ser ed that a higher test-day M r tected against c lling and di inished the e ect CCel he negati e e ect an ele ated CCel n the ris c lling as still resent i CC as el 0 000 cells er at the sec nd test-day alth gh t a lesser e tent

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he r se this research as t e al ate the e ects anthel intic treat ent at cal ing in herds t tally c n ined r se ic n ined d ring the s er eri d tally c n ined herds had n access t ast re and re ained h sed thr gh t s er hile se ic n ined herds had li ited td r e s re t a s all ast re r add c ll the c s ere ed st red eeds ade ate t eet their n triti nal re ire ents n th c n ined and se ic n ined herds c s ere gi en an e rin ectin r lace treat ent ar nd cal ing ti e and n signi icant e ect et een the t treat ents ere nd aecal egg c nts ere deter ined t e l in general M nthly il sa les ere tested ith an indirect sing a cr de *Ostertagia ostertagi* antigen ith res lts rec rded as DR al es n interacti n et een treat ent and DR as ser ed H e er the a th rs c ncl ded that their st dy ailed t sh a ene icial e ect r the e rin ectin treat ent in these herds

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he r se this st dy as t e al ate the i act s atic cell c nt CC in early lactati n CCel dairy hei ers n test-day M d ring the irst lactati n n increase in CCel as related t a decrease in M and this relati nshi as e en str nger hen n t ta ing the test-day CC int acc nt his eans that the negati e e ect ca sed y ele ated CCel as related t ele ated test-day CC later in lactati n n ele ated CCel at days in il had a re ad erse e ect than the sa e CCel earlier in lactati n t as c ncl ded that il r d cti n d ring the irst lactati n is hindered y an ele ated CCel and that re enti n is etter than c re

2 cts s r siti it r i l ia i iral iarrh a ir s *Mycobacterium avium* s s arat rc l sis a *Neospora caninum* c lli g air cattl i r a a ia r i c s

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his st dy ai s t deter ine the e ects ser siti ity r e s re t ine le e ia ir s ine iral diarrh ea ir s M t and C n general and reas n-s eci ic c lling in Canadian dairy cattle hey nd that the M -ser siti e c s r n ti es re ris eing c lled hate er the reas n r c lling than the M -ser negati e nes and this as ti es r c s c lled either r re r d cti e e iciency decreased il r d cti n r astitis n the case c lling r re r d cti e ine iciency C-ser siti e c s ran a ti es greater ris than C-ser negati e c s and in the case c lling r decreased il r d cti n this as 6 r c s in D -ser siti e herds c ared t D -ser negati e herds he a th rs c ncl ded that these res lts ill hel in nderstanding the ec n ic i acts these ath gens and t sti y their c ntr l

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n rder t d a irst screening r the resence hne s Disease D in a herd en y e-lin ed i n s r ent assays are ten sed hese tests ha e h e er ite l sensiti ities t the incl si n an a s r ti n hase c ld tentially increase the s eci icity and decrease the sensi ity the test est characteristics an a s r ed and n n-a s r ed indirect t detect D ere c ared n the c lati n sed it as nd that the n n-a s r ed test had a l er s eci icity t did n t ha e a higher sensiti ity than the a s r ed test

2 al ati thr s r *Mycobacterium avium* s s arat rc l sis si g tiss a a cal c lt r as c aris sta ar s

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he ect this st dy as t e al ate three ser s ne n na s r ed and t a s r ed indirect assay r detecti n anti dies against *Mycobacterium avium* s s arat erc l sis M t C aris n as ade et een the s and c lt re tiss e and aeces sa les c llected r dairy c s at sla ghter i teen ercent the ile and ass ciated ly h n des ere c lt red r M t - siti e and 6 ere aecal c lt re- siti e r M t ssessed sensiti ities the s ere higher r the n n-a s r ed hen c ared t aecal and tiss e c lt re than they ere r the a s r ed s hile the na s r ed had a l er s eci icity t as c ncl ded that sensiti ities the s ere l hen c ared t the tiss e c lt re he na s r ed had a greater sensiti ity and its s eci icity and acc racy ere l er

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his st dy ai s t deter ine the ass ciati n et een CM and the r rti nal distri ti n atterns s atic cell c nt CC in a herd n 2 dairy herds 20 0 test days and cases CM ere rec rded he larger rti n CM cases as ass ciated ith c ntagi s ath gens he distri ti n CC atterns as related t the incidence rate CM he a th rs c ncl ded that the ean incidences CC atterns a herd c ld e se l t deter ine hether r n t t intr d ce ath gen-s eci ic astitis c ntr l r gra s in that herd

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his st dy ai s t c are cyt r sh and la age techni es r the assess ent C in clinically n r al st art dairy c s C sa les ere c llected r H lstein c s t ice at 20 t days in il and t ee s later at t days in il sing th techni es de ined he ean ercentage cells that ere ne tr hils as signi icantly di erent n the irst isit t n t n the sec nd ne t as ser ed that the ercentage cells that ere ne tr hils decreased ith ti e a ter cal ing t n t ithin isit ne r isit t he terine dia eter as negati ely related ith l id rec ery y the la age techni e t the ean ercentage ne tr hils cells as n t in l enced y the l e l id rec ered in s ccess l atte ts e ertheless atte ts yielded n l id t as c ncl ded that the cyt r sh techni e is a c nsistent and relia le techni e t tain end etrical sa les r cyt l gic e a ination r st art dairy c s

2 t r i ati *Mycoplasma bovis* s sc ti iliti s agai st si a ti icr ial ag ts si g th t st th

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his st dy ai ed t deter ine the s sce ti ility *Mycoplasma bovis* against si anti i tics sing the test eth d l gy i ty-eight is lates *M. bovis* ere c llected r l ng tiss e syn ial l id trache - r nchial ash il and e ternal r inner ear discharge he anti icr ial agents tested ere a ythr ycin clinda ycin erythr ycin enr l acin s ectin ycin and tetracycline t as nd that resistance as n t related t the s eci en s rce e ce t r a ythr ycin t as n ted that tests all ed s t deter ine the *M. bovis* s sce ti ilities de nstrated the e icacy enr l acin and the ac ired resistance t tetracycline s ectin ycin a ythr ycin and clinda ycin

2 ct hal gi lactat th cc rr c *Crystosporidium parvum* a gr th atal air cal s

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he ect this st dy as t e al ate the e ect hal gin ne lactate n the cc rrence *Crystosporidium parvum* and gr th ne natal dairy cal es hirty- ne H lstein ll cal es ere rchased at irth and assigned an ral treat ent ith hal gin ne lactate in a e s carrier s l ti n r in lace t as nd that the dds *C. parvum* shedding a ng cal es in the hal gin ne lactate-treated gr ere 0 l er than in the lace gr cyst shedding cc rred ntil t ee s age in the hal gin ne-treated gr hile s e the cal es in the lace gr egan shedding cysts in their irst ee age n the lace -treated cal es gr 2 the sa les ere siti e t *C. parvum* hile nly 22 hal gin ne-treated cal es ere siti e t as als ser ed that the largest n er siti e tests t *C. parvum* cc rred d ring the third ee age t as n ted a ng cal es treated ith hal gin ne lactate there as a days delaying the incidence diarrh ea

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he r se this st dy as t e al ate the e ects arat erc l sis n c lling il r d cti n and il ality in in ected dairy herds Mil l d and aecal sa les ere ta en r 6 c s r nine herds aecal sa les ere e al ated ith yc acterial c lt re ser sa les ith a c ercially a aila le r anti dies against M t and il sa les ere tested ith an indirect r anti dies against M t t as esta lished that c s ith siti e res lts acteri l gical c lt re aeces and il had a l er il at and r tein r d cti n C s ith siti e res lts r each test ran greater ris s c lling t as c ncl ded that in these nine herds arat erc l sis as ass ciated ith a decrease in il r d cti n and c l nge ity

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n ir n ental and n triti nal changes trans rtati n and s cial re rgani ati n eaned cal es are all act rs that can e lin ed t the se erity ine res irat ry in ecti ns atal res irat ry in ecti ns are s ally the res lt a iral- acterial synergy his cc rs hen a ri ary iral in ecti n alters h st de ences and then a g ents the se erity a sec ndary acterial in ecti n and can ha en as a res lt di erent echanis s H st res nses ha ening d ring these res irat ry in ecti ns ay e analy ed y the disease challenge dels de el ed ty e iral- acterial synergy ri ary ine her es ir s- H - res irat ry in ecti n ll ed y a sec ndary challenge ith *Mannheimia haemolytica* that res lts in ine res irat ry disease RD has een st died his disease del as sed in this research t de nstrate that the iral- acterial synergy res lting in atal RD is signi icantly altered y stress t as nd that H - in ecti n enhanced the e ressi n t ll-li e rece t rs R and increased r -in la at ry res nses hich increase the se erity a *M. haemolytica* in ecti n his sh ed that R lays a decisi e r le in acterial in ecti n detecti n as ell as in ind cing r - in la at ry res nses Cell signalling ath ays are acti ated y n clear transl cati n the gl c c rtic id rece t r t it is n t ell nderst d h this r iral- acterial synergy can e enhanced y stress-ind ced c rtic ster ids

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2 ct tri al t acci agai st *Staphylococcus aureus* astitis l h c t s lati s a ti r cti a tr hil hag c t sis

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he ect this st dy as t e al ate the e ect a n el ine astitis tri alent accine that c ntains *Staphylococcus aureus* ca s lar lysaccharide ty e and 6 6 n ly h cyte s lati ns anti dy r d cti n and ne tr hil hag cyt sis reat ents c nsisted in an i ni ati n ith either the tri alent al ne tri alent e lsi ied in re nd s inc lete ad ant C tri alent in al ini hydr ide r ad ant nly C enty regnant hei ers ere accinated 0 days e re their d e date r cal ing ll ed y t sts in a t - ee inter al t as nd that ser antigen-s eci ic i n gl in g and g 2 ere increased d ring the eri d r e re cal ing ntil three ee s a ter cal ing r all accinated c s reat ent ith either ad ant increased the r d cti n g 2 c ared t the tri alent al ne slight increase in i ne sera ne tr hil hag cyt sis t the three ty es illed *S. aureus* as n ted t these ere n t signi icant d e t a large ariati n et een c s accinated c s sh ed a higher ercentage CD ly h cyte r ee s a ter the irst i ni ati n hile c s accinated ith tri alent accine and ad ants had an increased ercentage CD ly h cytes t ee s e re and t ee s a ter cal ing t as als ser ed that the h le cell tri alent accine elicits res nses s eci ic r the three ca s lar lysaccharide antigens inally the increase -s eci ic and g 2 as re isi le in the case accines ith ad ants

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he ect this st dy c nd cted in t e eri ents as t deter ine the e ects nensin R ensin R c ntr lled-release ca s le CRC e and R ensin R re i e 2 n eal re ency d ring grain-ind ced R in H lstein dairy c s ith th ty es R ensin eal re ency as l er d ring R eri ds than d ring ada tati n and rec ery eri ds H e er in e eri ent 2 the ad inistrati n nensin increased eal re ency th d ring R and rec ery eri ds t as s ggested that nensin re i ay increase eal re ency in lactating dairy c s nder R

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4 icac a i h r t at isi cta t agai st *Staphylococcus aureus* a *Streptococcus agalactiae* i ri tal chall g

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he ect this st dy as t assess the e iciency a i d h re teat disin ectant ll- ac c ared ith a siti e c ntr l adine hich is a c ercially a aila le i d h re teat disin ectant he c aris n as ade sing c s d ring a 0- ee eri d n ne in la at ry in ecti ns y *Staphylococcus aureus* and *Streptococcus agalactiae* there ere n di erences et een the test r d ct and the siti e c ntr l here as n di erence either in teat s in and teat end c nditi n sc res th tests r ided si ilar ger icidal acti ity d ring the ar seas n st dy eri d

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his st dy ai s t e al ate hether a c ercially a aila le sa nin- ad ant inacti ated ine res irat ry syncytial ir s R accine ld r tect cal es r e eri ental in ecti n ith ir lent R er negati e R cal es ere irst either n accinated r accinated t ice ith an inacti ated R accine ll cal es ere later challenged ith ir lent R ara eters e al ated ll ing the challenge ere clinical signs arterial 2 and i ne res nses ight days a ter the challenge cal es ere e thani ed and their l ngs e a ined t as nd that the inacti ated R accine s ccess lly a rded clinical r tecti n r e eri ental in ecti n ith the ir lent ir s 2 days a ter i ni ati n t als decreased the re alence and se erity l nary lesi ns icacy nit red ith this accine as si ilar t that ther inacti ated and di ied-li e R accines a aila le n the ar et

6 icac s ral s r l gical t sts a a tig s r iag sis i r c ll sis i th r s c als siti s r l gical r s lts t *Yersinia enterocolitica*

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he r se this st dy as t test in and reci itati n tests r cella - cr ss-reacting - s re resenting se eral -chain e it e c inati ns r cella c re li id e it es r gh r cella a rt s - -deri ed lysaccharide nati e ha ten lysaccharide r gh gr ter e rane r tein c le es rec inant 26 and cyt s lic r teins he ai these tests as t detect cattle r cell sis sensiti ity and t di erenciate it r alse- siti e ser l gical reacti ns R s eci icity t as nd that n single ser l gical test and antigen c inati n had a 00 sensiti ity and s eci icity si ltane sly n reci itati n tests ith nati e ha ten lysaccharide c nteri n electr h resis ith cyt s lic r teins and a cha tr ic ith r cella - ere 00 s eci ic H e er their sensiti ity as l er than ith the R se engal test c le ent i ati n and indirect ith r cella - s and nati e ha ten r - -deri ed lysaccharides he c etiti e ith r cella - and M C -s eci ic n cl nal anti dy as less s eci ic and sensiti e than the ther tests ensiti ity s eci icity rati s ith r cella s is 2 - *Escherichia hermannii* - s 26 rec inant r tein and r cella cyt s lic racti ns ere n t ade ate t as c ncl ded that n ne these c inati ns lly res l ed the diagn sis ine r cell sis in the resence R netheless s e these are ite si le and r ide ractical alternati es t the r cellin s in test c rrently sed r di erential diagn sis

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n this st dy ari s alternati e antigen ad ant c inati ns t the acill s cal ette erin C -ind ced ri ied r tein deri ati e D -elicited t erc lin s in test ere e al ated as ind cers delayed-ty e hy ersensiti ity D H hey ere c ared t the C D test syste in rder t ind a s in D H r t c l that d es n t cr ss-react ith the t erc lin test and all s identi icati n high and l CM R res nder hen ty es hirty n n-lactating c s ere sensiti ed ith yc acteria C MC and al in e lsi ied in re nd s c lete ad ant n n- lcerati e re nd s ad ant c lete r MC hree ee s later c s ere in ected intrader ally ith ari s test antigens incl ding D t erc lin hlein and al in s a negati e c ntr l h s hate ered saline as incl ded and -cell it gen hyt eggl tinin H as ad inistrated inally treat ents C D and *Mycobacterium phlei/phlein* ere gi en ith a re nd s ad ant-ind ced e i alent D H ith ea reacti ns at 2 h rs t h rs a ter the antigen in ecti n t as nd that the hlein syste ind ced D H and as si ilar t D H ind ced y the C D syste hen MC as gi en ith a re nd s ad ant t as c ncl ded that this r t c l as s ita le r detecting high l CM R res nders in research herds t cr ss-reacti n t D as e ident ll ing ind cti n D H sing *M. phlei* e ertheless the r t c l d es n t ease the r le arti icial ind cti n D H cr ss-reacti ity and ld n t e s ita le r c ercial herds here t erc lin testing is re ired

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he ect this st dy as t deter ine hether res lts tained r il and ser sa les ith s intended r diagn sis arat erc l sis in dairy c s ere c ara le t th se tained y eans yc acterial c lt re aecal sa les a les ere ta en r 6 lactating dairy c s in nine herds r ntari aecal sa les ere tested ith yc acterial c lt res and ser sa les tested r anti dies against M t ith Mil sa les ere tested ith an indirect r anti dies against M t Res lts ere siti e r the ser sa les il sa les and 0 aecal sa les here as a derate c rrelati n et een aecal and il res lts aecal and ser sa les ga e res lts that ere signi icantly di erent res lts r il sa les had a higher c rrelati n ith th se yc acterial c lt re than th se ser sa les Res lts s ggest that the indirect test sed n il sa les c ld r ide a g d eth d r detecting arat erc l sis in dairy herds

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he ect this st dy as t assess the i act a c ntr lled-release ca s le CRC nensin gi en e re cal ing n st-cal ing ha t gl in and t st dy the r le the disease n ha t gl in enty- i e ntari dairy herds 0 0 c s ere gi en rand nensin CRC r lace ca s les three ee s e re cal ing t as ser ed that ha t gl in c ncentrati ns ere higher ne ee a ter cal ing than si ee s a ter n ni ariate analysis any diseases ere ass ciated ith ha t gl in c ncentrati ns h gh the cc rrence diseases see ed t e a c n nding act r in the data inter retati n he a th rs then strati ied the analysis y the resence r a sence the disease here see ed t e a relati nshi et een act rs ther than clinical disease that c ntri ted t increased c ncentrati ns ha t gl in H e er ha t gl in ser ed as a g d indicat r in la at ry disease n clinically nhealthy c s nensin CRC treat ent as ass ciated ith increased ha t gl in c ncentrati ns er c ncentrati ns ha t gl in in nensin CRC-treated healthy c s s ggest a ssi le re lecti n red ced s clinical disease

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he r se this st dy as t descri e the ri icati n a las a l c ing act r h se acti ity as resistant t heating t 6 C r 0 in tes and as attri ta le t i r nectin-c ntaining c le a t 20 Da nder n n-red cing c nditi ns r tein ith a si e 220 Da and a as identi ied as a e er the i r nectin gr lec les y sing a t -di ensi nal lyacryla ide gel electr h resis and atri -assisted laser des r ti n i ni ati n ti e light ass s ectr etry th the ri ied r tein and c ercially a aila le ine i r nectin inhi ited r d cti n in nat rally in ected eri heral l d n n clear cells H e er the i r nectin as less i l gically acti e

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his st dy ai s t identi y eta lic tests a aila le in clinical ractice that identi ied c s at increased ris le t dis laced a as s D C s r 20 herds 0 c s ere isited r ne ee e re t ne ee a ter cal ing dy c nditi n sc res ere rec rded and sa les c llected and analy ed r ser n n-esteri ied atty acids ch lester l eta-hydr y tyrate H gl c se rea calci and h s h r s Mil sa les ere c llected ne ee a ter cal ing t eas re the H c ncentrati n t as nd there ere D cases and the edian ti e r diagn sing the dis rder as days in il e re cal ing nly c ncentrati ns ere ass ciated ith the ris de el ing D C s ha ing a c ncentrati n e al t r higher than 0 ere 6 ti es re lia le t de el ing D a ter cal ing Retained lacenta etritis and increased ser c ncentrati ns H and ere related ith an increased ris s se ent D ith H ser c ncentrati ns a ter cal ing as eing a re sensiti e and s eci ic test than c ncentrati n C s ha ing a il H c ncentrati n e al t r s eri r t 200 icr l ere ti es re li ely t de el D t as c ncl ded that eta lic tests r transiti n dairy c s sh ld c s n in the ee receding cal ing and H in the irst ee a ter cal ing

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accine-ind ced c sal i ne res nses in r inants can e e ecti ely analy ed y the s rgical re arati n lti le sterile intestinal l s his st dy ai ed t e al ate intestinal l s as a del r gen ic analysis c sal i ne res nses Micr array analyses ere er r ed t deter ine i gene e ressi n in the s all intestine ne nth- ld cal es is altered y s rgery and eli inati n icr l ra ressed se ence tags signi icantly and di erentially changed in e ressi n at 2 h rs a ter the s rgery hereas 0 these genes ere -reg lated t as de nstrated that 2 days a ter s rgery a large rti n genes ere ret rning t aseline e ressi n t as nd that nly a in r n er genes ere altered y s rgery and eli inati n icr l ra t these nes ere tightly in l ed t n r al c sal ncti n t as c ncl ded that intestinal l s st e incl ded in the c nd cti n c sal gene e ressi n analyses ith the ne- nth- ld cal

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he lac a aila ility t ls t analy e h st and ath gen res nses is a li iting act r in the lec lar analysis disease ath genesis H e er ne eth d l gies s ch as icr arrays are n c nteracting these li itati ns as they er it a ra id characteri ati n gl al gene e ressi n indi id al cells and tiss es his re ie addresses ainly the icr arrays techn l gies as a ean t in estigate the ncti nal ath gen ics in ecti s disease in cattle n er iss es that are essential t c nsider hen designing in itr and in i del syste s t analy e h st res nses t a s eci ic ath gen and c arati e ncti nal gen ic strategies are disc ssed here hese strategies are als a lica le r the in estigati n cell-signalling ath ays and analysis innate i ne res nses t re generati ns data ase c ld e enriched y these icr arrays analyses h st and ath gen res nses i itati ns these c arati e analyses as regards ality data ases the c lete ncti nal ann tati n the ine gen e and an indicati n t re de el ents t accelerate the alidati n data generated hen a lec lar characteri ati n disease ath genesis in cattle are als disc ssed

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44 r al c *Cryptosporidium parvum* i cti i s th st r tari a its ass ciati ith iarrh a i atal air cal s

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he re alence *Cryptosporidium parvum* in ecti n as e al ated in 00 dairy cal es s th estern ntari and its ass ciati n ith diarrh ea in ne natal dairy cal es as als assessed he in ecti n as detected in 0 6 cal es and ithin- ar re alence ranged r 0 t 0 t as als nd that th shedding and intensity shedding ere signi icantly related t diarrh ea t as c ncl ded that this as a c n arasite in ntari dairy cal es and as an i rtant ca se dairy cal sc rs

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his st dy ai s t assess the e ects ine las a n cell ia ility and 2 e ressi n as ell as the e ects ri ied n r tein synthesis and gene e ressi n sh rt-ter c lt res ine ly h cytes t as nd that the additi n 2 las a r se i- ri ied t c lt res had n signi icant e ect n cell ia ility H e er it ca sed a signi icant decrease in 2 r d cti n and signi icantly increased de n r tein synthesis R essages genes in l ed in cell di isi n cell eta lis and gene reg lati n ere -reg lated sing a h an icr array

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l c se trans rt y is lated ine a ary e ithelial cells in l es transl cati n acr ss the cell e rane int a c art ent that e changes sl ly ith l cyt s l his research ai s t e a ine sing generati n deling trans rt analysis and eta lis data the signi icance t gl c se eta lis this c art entali ati n i e-c rse c r es ere s ected t c art ental analysis in rder t tain gl c se trans rt del ara eters hereas lact se synthesis gl c se idati n rates and cell lar c ncentrati ns inter ediary eta lites gl c se-6- h s hate and gl c se- - h s hate ere eas red at aried edia gl c se c ncentrati ns t as nd that the del that integrates gl c se trans rt and eta lis nder- redicted the rates lact se synthesis and gl c se idati n l c se sh ld e a aila le r h s h rylati n nce transl cated acr ss the cell e rane in rder t acc nt r the rates ser ed gl c se se t hysi l gical gl c se c ncentrati ns eta lic c ntr l analysis indicated that h s h rylati n y he inase e erts 0 the c ntr l gl c se eta lis t lact se and C_2 hile trans rt e erts the re aining 20

4 r i *Neospora caninum* i air a cattl a a ia rs cti

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his re ie s ari ed the c rrent nderstanding *Neospora caninum* C in dairy and ee cattle r Canadian ine s ecialists he li e cycle the agent its trans issi n echanis s clinical signs tests t diagn se the in ecti n i acts the in ecti n ris s act rs its cc rrence and c ntr l eth ds are c ered in the re ie t als c ntains data n the re alence the in ecti n in Canadian dairy and ee cattle and c aris ns ith the re alence in ther c ntries his re ie r ides the in r ati n necessary t design re e ecti e r gra s r the c ntr l C-ass ciated disease

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4 is act rs ass ciat ith *Neospora caninum* a rti i tari H lst i air h r s

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his e ide i l gical research ai s t identi y ris act rs r *Neospora caninum (* C -related a rti ns in ntari H lstein dairy herds C s r herds ere l d sa led and sera ere analy ed r anti dies t C sing a inetic n r ati n c ncerning h sing ani al s ecies resent an re anage ent re r d cti n i sec rity ractices ildli e ser ati ns eri- art rient c anage ent herd disease hist ry and n triti n ere c llected a ng dairy herds t as nd that the C herd ser re alence the n er d gs er ar the re ency that d gs ere ser ed de ecating in angers the n er h rses er ar and the ser ed ann al rate c s ret rning t estr s a ter regnancy c n ir ati n ere siti ely related t C a rti ns in a herd H e er re ency stray cats and ild canids ser ed n a ar and the h sing hei ers n l a ing ac s ere negati ely related t C a rti ns in a herd

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4 r r al c a ti i s agai st i l ia ir s i iral iarrh a ir s *Mycobacterium avium* s s ci s arat rc l sis a *Neospora caninum* i air cattl i as atch a

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e al ate the ser re alence anti dies against ine le e ia ir s ine iral diarrh ea ir s D *Mycobacterium avium* s s arat erc l sis M t and *Neospora caninum* C in dairy cattle in as atche an l d sa les ere ta en r 0 dairy c s in dairy herds C s tested siti e r anti dies against M t and C at ercentages 2 and 6 res ecti ely and 2 2 e al ated herds had n accinated c s that ere ser siti e r D

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n this research the h es 6 lactating H lstein c s ere e a ined t ice ith in rared R ther gra hy and is al e a inati n r s le he rrhages and nderr n heels t as nd that the te erat res the c r nary ands c s ere higher r early idlactati n c s than r late-lactati n c s Delta as als higher r lateral cla s than r edial cla s he re ency s le he rrhages in hind lateral cla s as higher r early idlactati n c s hile nderr n heel as re re ent in late-lactati n c s ncreased te erat res the c r nary and and Delta in early idlactati n c incided ith an increase in the incidence s le he rrhages s c s in early idlactati n sh ed higher h te erat res eas re ent h te erat res a ng c s in early lactati n ay e se l in nit ring h health

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his st dy ai ed t de el an e eri ental del se tic arthritis in cal es r hich t e al ate the treat ent e ect n cyt l gic and acteri l gic aria les syn ial l id er r this st dy the right tars s se en healthy H lstein ll cal es ere in c lated ith 0 c l ny- r ing nits ia le *Escherichia coli* a a - siti e strain Clinical signs se tic arthritis ere ser ed d ring days 2 and in all cal es n Day 2 the acterial c lt res all cal es ere *E. coli*- siti e ne cal re ained siti e ntil Day and i e cal es re ained siti e ntil Day ly erase chain reacti n CR res lts ere als siti e r all cal es and re ained siti e r ari s eri ds a ng cal es t ere all siti e again n Day 2 n days 2 t syn ial l id ne tr hil c nts and hite l d cell c nts increased hile syn ial t tal r tein c ncentrati ns increased d ring all the e eri ental eri d c ared t Day Clinic ath l gical signs in la ati n ersisted r 20 days H e er acterial c lt res ere negati e n Day t as c ncl ded that this del s ccess lly ind ced ac te se tic arthritis and i treated at the eginning the disease it as ssi le r cal es t rec er ithin ne ee

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his st dy ai s t e al ate the e ressi n the antiangi genic thr s ndin a ily and r angi genic asc lar end thelial gr th act r in ari s si es healthy ine llicles aries ere c llected r sla ghterh ses and healthy llicles ere s rted n the asis si e s all edi and large t as nd that as signi icantly higher in s all llicles s ch as - and -2 R he gran l sa layer as nd t e the ri ary area ithin the llicle in l ed in generati n and s all llicles had the highest r rti n i n siti e cells t as als ser ed that c l cali ed ith CD 6 n gran l sa cells in the llicle and in c lt red cells and H sti lated C e ressi n e ressi n increased d ring gr th and de el ent llicle he a th rs c ncl ded that - and -2 ere c rdinately e ressed in the e tra asc lar c art ent the ary d ring the early llicle de el ent and as in ersely e ressed hese res lts s ggest that these r teins ay e in l ed in reg lating gr th and de el ent the llicle in a n el ashi n

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he ect this st dy as t deter ine hether r n t the il r d cti n res nse r endect cide treat ent at cal ing c ld e redicted achie e this an indirect stertagia stertagi as sed in late-lactati n il sa les c llected r c s in c n ined and se i-c n ined dairy herds r rince d ard sland a c tia and s thern ntari C s ere treated ith e rin ectin r- n endect cide r ith a lace s l ti n and res lts the indirect test ere e ressed as tical density rati s DR seas nal attern as nd in re-cal ing DR t e higher in s er and all and l er in inter re-cal ing DR al es ere als higher in lder c sa les a les r c n ined and se i-c n ined herds aried in their arasite anti dies hich ere greater in the se i-c n ined herd sa les rther re there as a signi icant interacti n e ect et een treat ent and re-cal ing DR n il r d cti n res nse a ter endect cide treat ent t as c ncl ded that the relati nshi et een re-cal ing DR and r d cti n res nse a eared t e adratic and that DR al es c ld e sed t redict the e ected res nse t anthel intic treat ent

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4 s a a titati str g i a r ach t t r i th cha is r aci as a r aliti s i sic cal s ith r ith t iarrh a

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he r se this st dy as t e eri entally e al ate t t -al ha and net r tein charge al es r cal las a in rder t a ly the antitati ely t data r sic cal es t deter ine nderlying echanis s r the ser ed acid- ase dist r ance Mean al es r cal las a ere t t 0 l g t tal r tein r 0 662 l g al in hile -al ha ga e 0 he net r tein charge cal las a as 0 hich is e i alent t 0 g t tal r tein r 0 g al in t as nd that acide ia as stly d e t a str ng i n acid sis in res nse t hy natre ia acc anied y n r chl re ia r hy erchl re ia and the resence nidenti ied str ng ani ns Res lts tained r this st dy c n ir c rrent rec endati ns that treat ent acide ia in sic cal es sh ld c s n intra en s r er s ad inistrati n a l id c ntaining s di and a high e ecti e single intrader al t erc lin test D inde endently the resence r a sence diarrh ea

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he ect this research as t e al ate the ass ciati ns herd il r d cti n and the anage ent aria les t a ret rn- er- eed R herd r it inde he R inde as deri ed r il inc e and eed c st hich are t i rtant r it deter inants in dairy ar s Data c ncerning n triti n h sing health herd il r d cti n il c nent ercentages and s atic cells c nt r dairy herds ntari ere c llected tandardi ed il r d cti n il r tein ercentage il at ercentage and the se nensin in lactating c diets ere incl ded in the linear regressi n del acc nting r a signi icant ariati n in the R t as nd that a g increase standardi ed il r d cti n er day er c as ass ciated ith an increase 0 day er c hile an increase 0 in il r tein as ass ciated ith an increase 0 26 day er c in the R the dairy herd he se nensin as als ass ciated ith a 0 day R increase er c H e er an increase in il at led t a 0 0 day R decrease er c t as als nd that herds il ed three ti es a day r d ced a higher 2 day R er c accinati n r *Escherichia coli* astitis as ass ciated ith a 0 day R increase er c he a th rs c ncl ded that the aria les related t r d cti n acc nted r re i rtant ariati ns in the R inde than the anage ent aria les hich nly arginally increased R2 r d cti n- ased regressi n dels

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Re r d cti n

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n itr ertili ati n and n clear trans er ine e ry s are t ite di erent techni es lth gh the in itr de el ent is si ilar in th techni es st-i lantati n s r i al is signi icantly red ced in e ry s he ai this research as t c are ser and ine ser al in s le entati n d ring cytes at rati n and e ry c lt re and e ry s e eri ents ere c nd cted he irst c nsisted in treating cytes and e ry s d ring at rati n and r c lt re ith synthetic id ctal l id edi s le ented ith either ser atty acid - ree r racti n in rder t e al ate the in itr ertili ed e ry de el ent e al ate e ry de el ent a sec nd e eri ent as er r ed in hich cytes ere at red ith either and r ith l s ser hile rec nstr cted e ry s ere c lt red ith th and he steer ser gr sh ed a higher n er last cysts n Day 6 in the in itr ertili ed gr s Hatching re encies ere als higher r gr s ith ser n days and sa e r n Day higher r rti n M cytes an increased last cyst de el ent and hatching rates ere nd in the resence ser d ring M r the treat ent gr s t as c ncl ded that in the case th ser and r ide si ilar e ry de el ent hich is n t the case r ine e ry s

2 ct i t r r ta r stagla i i s th sis tra s rt a sig alli g at th ti at r al r c g iti r g a c i cattl i c l cri acti s r stagla i 2

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Many interacti ns et een c nce t s ter s and c r s l te C are in l ed in the rec gniti n and esta lish ent regnancy n r inants inter er n- ta ta e ry nic rigin is the regnancy rec gniti n signal hereas end etrical r staglandin 2 al ha 2 al ha is the l te lysin and 2 is a l te r tecti e ediat r at esta lish ent regnancy H e er the relati nshi et een ta and end etrical s r d cti n trans rt and signalling at the ti e aternal rec gniti n regnancy MR still is largely n n n he ai this research is then t st dy this relati nshi he e ressi n the en y es in l ed in the eta lis 2 and 2 al ha cyc ygenase- C - and C -2 synthases and -dehydr genase trans rters 2 and 2 al ha rece t rs ere e a ined t a eared a ter analysis the res lts that ta increases either directly r indirectly 2 i synthesis as ell as 2-ass ciated signaling in end etri y etri and c r s l te d ring the MR Res lts als s ggest that 2 c ld e in l ed ith end etrical rece ti ity y etrial iescence and l teal aintenance hich indicates lycrine acti ns 2 at MR t as c ncl ded that the inhi iti n 2 al ha and the increase in 2 r d cti n are essential r the esta lish ent regnancy in dairy cattle

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s ressi n cell r li erati n cc rring at the last cyst stage ca ses a c nditi n n n as e ry nic dia a se his is a c nditi n te rary s s ensi n r the de el ent the a alian e ry t is an e l ti nary strategy t g arantee the s r i al ne nates here are t ty es dia a se ligate and ac ltati e he ligate dia a se cc rs in each gestati n in s e s ecies hile the ac ltati e dia a se is s ally ass ciated ith lactati n hich ca ses an i rtant eta lic stress t the a alian he en ir n ental hy heasal arian and terine echanis s are the reg lat rs alth gh these ay ary a ng s ecies and et een ligate and ac ltati e c nditi n the nset aintenance and esca e r dia a se t the 0 r hase the a alian e ry cell cycle a it sis arrest cc rs hich ay e ca sed y the e ressi n a s eci ic cell cycle inhi it r he r li erati n re rise in a alian s ecies ay e reg lated y the e ressi n rth l g s genes he r li erati n reg lati n in n n- a alian dels ay hel in nderstanding that atter

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he ine s er at a ind t the e ithelial cells the id ct t re ain ali e ntil ertili ati n Car hydrate c nents the latter are in l ed in these s er id ct interacti ns H e er n r tein has een identi ied t lay this r le he ect this st dy as t identi y the id ct act rs in l ed in the s r i al ine s er at a achie e this s er cells ere reinc ated ith a ical e ranes is lated r id ct e ithelial cells ashed and then rther inc ated ith t the a ical e ranes er ia ility tility and acr s al integrity ere ser ed t e i r ed in the sec nd inc ati n er at a ere als inc ated ith a ical e ranes la elled ith ethi nine and r teins ere se arated thr gh e tensi e ash y t -di ensi nal gel electr h resis in rder t identi y the tential act rs ha ing ene icial e ects n s er at a i a r r teins ere then e tracted r an ther t -di ensi nal gel and r cessed t se ence the irst a in acids r these r cessed r teins it as nd that ne as identical t heat sh c r tein 60 H 60 and ne t the gl c se-reg lated r tein R he a th rs re rt the l cali ati n these r teins n the l inal a ical s r ace the id ct e ithelial cells their inding t s er at a and the resence end gen s H 60 in the s er id iece in this article

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t l sis s t str s a lati i H lst i h i rs gi r stagla i 2al ha c rr t ith r 24 h rs ri r t r al a i t r agi al r g st r r l asi g ic

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n this st dy the e ects gi ing r staglandin 2al ha c nc rrent ith r 2 h rs e re the re al an intra aginal r gester ne-releasing c ntr lled internal dr g released C DR de ice ere deter ined he e ects these treat ents ere e al ated n l tel lyis the synchr ny estr s and lati n ighteen st ertal H lstein hei ers ere treated ith C DR and g nad tr in-releasing h r ne nRH and assigned t ne three gr s arying in the ti e that as gi en i e inter als r C DR re al t the nset the standing estr s and lati n ere n t di erent a ng the three gr s here ere l nger inter als r C DR re al t estr s and lati n in hei ers that ere in etestr s at the ti e C DR inserti n than th se at estr s r di estr s t inter als r standing estr s t lati n ere n t di erent teal regressi n synchr ny estr s and lati n c s that recei ed at the ti e C DR re al ere n t a ected y the treat ent

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he r se this st dy as t e al ate the a ility di erent c ncentrati ns ine llic lar l id t s rt in itr at rati n cytes and s se ent de el ental ca acity he e al ated c ncentrati ns ere and 0 he as deri ed r c etent cells r r a l s all llicles c ing r a at ir-deri ed aries cytes reaching the last cyst stage ere re n er s hen c lt red ith r c etent llicles he last cyst r d cti n rate r these c etent llicles as increased d e t a synergy et een estradi l and the rec inant h an llicle-sti lating h r ne he inner cell ass and tr hect der cell n ers indicated the ality last cysts r r c etent and s all llicles res ecti ely t as c ncl ded that the de el ental c etence a at ir-deri ed cytes as increased y llic lar l id c ing r c etent llicles

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his research ai ed t d c ent arian and end crine res nses ass ciated ith the treat ent cystic arian llicles C in dairy c s sing g nad tr in releasing h r ne nRH and r staglandin 2 al ha ith r ith t e gen s r gester ne he st dy as als eant t e al ate regnancy esta lish ent ll ing synchr ni ati n lati n al ng ith ti ed inse inati n in c s diagn sed ith C trials ere c nd cted he irst c nsisted ad inistering c s diagn sed ith C t in ecti ns nRH nine days a art ith gi en se en days a ter the irst nRH treat ent hese c s ere then inse inated 6 h rs a ter the sec nd in ecti n nRH ll c s treated de el ed a ne llicle a ter the irst nRH in ecti n M st the lated a ter the sec nd in ecti n e en c s t ere c n ir ed regnant a ter a regnancy diagn sis he sec nd trial c nsisted ad inistering nRH and an intra aginal r gester ne de ice C DR e en days ll ing the treat ent these c s ere gi en and t days later the C DR as re ed t as nd that las a estradi l c ncentrati ns decreased a ter the C DR inserti n ll c s de el ed a ne llicle a ter eing treated ith nRH and al st all c s lated the ne llicle ter C DR re al estradi l-s rge and estr s cc rred s ntane sly t as c ncl ded that the ad inistrati n nRH ll ed ith se en days later res lted in the de el ent a ne llicle in c s diagn sed ith C he synchr ni ati n lati n and ti ed inse inati n res lted in a regnancy rate

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he r se this st dy as t assess the e ects regnancy and artic larly n end etrial gene and r tein e ressi n related t the aintenance regnancy in n n-lactating c s at Day t as nd that treat ent increased the steady state c ncentrati n the yt cin rece t r R R and the steady state c ncentrati n the r gester ne rece t r R R al ng ith the H -2 r tein hereas it decreased the R a ndance in the str al layer the end etri regnancy al ne als had s e e ects t decreased the a ndance in estradi l rece t r al ha Ral ha R hile the latter as sti lated regnancy als increased the H -2 r tein hich as nd nly in the l inal e itheli cells the end etri the R r tein in e ithelial cells and the terine glands D ring regnancy the treat ent res lted in a decreased Ral ha R and in a l er R r tein res nse hich as n t the case r n n-treated regnant c s he a th rs c ncl ded that di erent R and r tein res nses ere identi ied et een c ntr l and regnant c s related t r staglandin i synthesis rther re changes ind ced y the treat ent ay ha e s e i act n the echanis s ass ciated ith the aintenance regnancy in n n-lactating c s

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he r se this st dy as t de el an in itr test t redict the ertility lls in the ield achie e this the a th rs in estigated the ll e ect n in itr e ry r d cti n na inding and acr s e reacti n as ell as the c rrelati n et een this e ect and ield ertility hich as eas red n a 60- t 0-days n n-ret rn rate hey sed r en se en hich as tha ed and led M tile s er as selected and its acr s e stat s as assessed Clea age and last cyst r d cti n rates ere als assessed and the n er s er nd t the na ell cida at re cytes as deter ined he ercentage acr s e-reacted s er at h rs as increased c ared t hat as eas red at 0 h r er - na inding rates ere di erent a ng s er sa les r y ng lls egati e c rrelati ns ere nd et een acr s e-reacted s er at 0 h rs and s er - na inding rates and clea age rate hile siti e c rrelati ns ere ser ed et een acr s e-reacted s er at h rs s er - na inding rates and clea age rate he a th rs c ncl ded that a c inati n in itr tests hich incl des the ercentage s ntane sly acr s e reacted s er at tha ing al ng ith re-ree e tility can e se l in redicting ll ield ertility e ertheless the c inati n assays has yet t e deter ined

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he r se this st dy as t e al ate the e ect a single ad inistrati n ce ha irin i r cl r sten l i n the re r d cti e er r ance dairy c s ith s clinical end etritis C s in early lactati n deter ined n r al r clinical end etritis ere s ected t a re r d cti e e a inati n hich incl des rectal al ati n ltras n gra hy and end etrical cyt l gy C C s recei ed ne three treat ents n treat ent c ntr l en athine ce ha irin i r cl r sten l i hey ere nit red r their re r d cti e er r ance d ring eight nths ll ing the treat ents Res lts sh ed there as an increase in the relati e regnancy rate c s ith s clinical end etritis a ter the ad inistrati n either ce ha irin i r cl r sten l i in c aris n ith c ntr l c s t as c ncl ded that ad inistering ce ha irin i r cl r sten l i in early lactati n et een 20 t days in il i r ed the re r d cti e er r ance c s a ected y s clinical end etritis

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ct r s chr i ati si g r stagla i 2 al ha a a il cti t st r g a c rat a t r th ti arti icial i s i ati r t c l H

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ith sli h s H alt

his st dy ai ed t e al ate i 2 al ha ind ced il letd n M is a recise indicat r l te lysis all ing c s t e synchr ni ed t egin the CH r t c l at the est ti e in the estr s cycle t als ai ed t assess e ent al i r e ent in the regnancy rate R er r the st dy lactating c s et een and 0 days in il ere sed t as nd that c s treated ith R CH had regnancy rates and th se treated ith CH had regnancy rates 2 hen data r th gr s ere c ined R as greater in c s that started the CH r t c l in stage 2 H e er c s treated ith R CH sh ed a greater r rti n lati n a ter nRH l te lysis a ter 2 al ha and lati n a ter nRH 2 t as als nd that l te lysis as indicated y the M test ith a g d en gh acc racy t ti e initiating the CH treat ent his initiati n ti e is et een days and the cycle he a th rs c ncl ded that sing the CH r t c l and initiating it in the eri d et een days and the cycle enhanced a greater regnancy rate and i r ed the e icacy each in ecti n

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2 cts s r a c l s c ll a si ar r g tra scri ts i i c l s c t c l s ri g at rati i itr

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he r se this st dy as t e al ate the distri ti n transcri ts enc ding H rece t r Hr H rece t r Hr c nne in C cycl ygenase-2 C -2 and r staglandin -2 rece t rs 2 and 2 and ithin ine c l s- cyte c le es C C and den ded cytes he research als ai ed t assess the in l ence g nad tr ins ser and c l s cell e ansi n as regards the a ndance transcri ts enc ding these genes C C ere treated in c lt re ith ser and g nad tr in-s le ented edia t l at the e ects n R transcri t t as nd that Hr Hr and R s ere detected in intact C C hile C C -2 and 2 R s ere identi ied in C C and in cytes here as a decrease in the e ressi n all R s e ce t r Hr d e t the resence ser in at rati n edia hich s ggests that this ne altered the relati e a ndance C C R s

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r ssi cli ss g r is r s a i itiati c t las ic l a lati i th i c t

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n ther s ecies cyte cyclin R g es thr gh cyt las ic lyadenylati n translati n d ring the in itr at rati n he ect this st dy as t assess i the sa e a lies t ines Cyclin R as resent in t is r s ith di erent - R lengths nly the l nger ne has a tati e cyt las ic lyadenylati n ele ent C se ence and ther reg lat ry se ences t as ser ed that in ger inal esicle-stage cytes the cyclin ears a ite l ng ly tail hich ec es e en l nger e re eta hase H e er hen the aries and the cytes are trans rted and ani lated n ice t st the lyadenylati n r cess the cyclin ears a sh rt ly tail he cyt las ic lyadenylati n r a ly cc rs d ring the ary trans rt in ar saline hen cytes are still in their llic lar en ir n ent t as sh n that there as a lin et een cyt las ic lyadenylati n cyclin and translati n a earance cyclin r tein e re in itr at rati n

4 H i h thala ic r r cti tiss s

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nRH is essential t a alian re r d cti n hat h r ne s ch as its anal g es is ten sed r the treat ent h r ne-de endant diseases and in assisted re r d cti e techn l gy here are di erent r s nRH st li e there are s e str ct ral ariants it hree di erent r s and str ct ral ariants ha e yet t e rec gni ed he ain s rce and target sites nRH are the hy thala s and it itary t e tra-hy thala ic nRH and nRH rece t rs ha e een nd in any re r d cti e tiss es Recent st dies de nstrated these ere re a ndant in arian end etrial and r state carcin as he resence nRH- in s e re r d cti e tiss es s ggests that it ay lay distinct r les in these tiss es nRH- is ainly e ressed in e tra it itary re r d cti e tiss es ere it r d ces its e ects y C- 2- D- and C-signalling ath ays n these tiss es nRH is c nsidered t act in an a t crine r aracrine anner and t reg late arian ster id genesis nRH as als nd t ca se a sti lat ry e ect n asal ster id genesis as ell as an inhi it ry e ect n g nad tr in-sti lated andr gen i synthesis in ale g nads ince nRH e ists nder di erent r s it indicates the resence distincti e c gnate rece t r ty es in erte rates and this can c ntri te t the de el ent ne anal g es nRH ha ing a highly selecti e and c ntr lled acti n n di erent re r d cti e tiss es

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VIDO Vaccine and Infectious Disease Organization

he ai this research as t identi y a tential inter erence ine her es ir s- H - ith s er cyte interacti ns d ring ine in itr ertili ati n er - na inding as inhi ited at al st 0 and that as ediated thr gh a ir s-s er at a interacti n t as ser ed that the H - antiser re ented the ir s-ind ced inhi iti n the s er - na inding hich indicates that the ertili ati n r cess is a ected y the H - itsel n rder t ind t hich glyc r tein s are res nsi le r the ir s-s er interacti n the ir s as treated ith n cl nal anti dies against r glyc r teins g gC gD and gH e re inse inati n t as nd that the inhi it ry e ect as c letely re ented y anti-gC hereas anti-gD enhanced a decrease that inhi iti n er - na inding as als decreased y ri ied gC and gD ith gC eing re e ecti e than gD hat inding rther sh ed the in l e ent gC and gD in the ir s-s er interacti n and it indicates that the ir s inhi its the ine s er - na inding thr gh its interacti n ith s er at a iral glyc r teins gC and gD ediated the inding H - t a s er at n and this see s t e si ilar t the attach ent echanis s H - t its nat ral h st

6 s lati a charact ri ati gl c sa i gl ca s r i llic lar l i s a th ir ct s r ca acitati

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his st dy ai ed t ri y large a nts glyc sa in glycans r ine llic lar l id s as t characteri e the t als ai ed t deter ine their tential in ca acitating s er as a tential alternati e t he arin hich is n t resent in genital tract l ids the e ale n rder t deter ine their tential t ca acitate s er he aran s l ate and ch ndr itin s l ate hich are t resent in ere is lated then ri ied ne these treat ents sti lated the s er acr s e reacti n t th - and he arin sti lated s er ca acitati n He aran s l hate as re acti e t r te s er ca acitati n than ch ndr itin s l hate e en th gh ch ndr itin s l hate sti lated t ice re s er ca acitati n than the c ntr l t as als nd that increasing the racti n he aran s l hate did n t alter the s er ca acitati n str ng interacti n et een - ith ine se inal las a r teins as sh n t as c ncl ded that the st e ecti e r s er ca acitati n resent in as the he aran s l ate

r g st r as ti r t c ls si g H rci H r stra i l c i at r air h i rs aria a cri r s s s a r g a c rat s

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he r se this st dy as t c are the e iciency nRH rcine H H and estradi l cy i nate C in a di ied CH i ed-ti e r t c l his r t c l incl ded a c ntr lled internal dr g r gester ne release C DR de ice r days he irst e eri ent c nsisted gi ing a C DR n Day 0 t hei ers ll ed ith a treat ent n Day he hei ers ere als gi en a d se saline nRH C r g H at C DR inserti n and re eated n Day sa e C hich as re eated n Day 2 hen the C DR as re ed l nger inter al t lati n as ser ed ith the ad inistrati n g H and the ean ea H c ncentrati n as als l er in hei ers recei ing g H n the sec nd e eri ent hei ers treated ith the C DR- ased CH r t c ls recei ed either a l d se 2 H a high d se 2 g H r nRH Higher las a c ncentrati ns H ere ser ed r hei ers treated ith the higher H d se than r the nes treated ith nRH i teen the hei ers lated r gester ne c ncentrati ns ere higher r hei ers treated ith the higher d se H n days and hich c ld ean that they had an enhanced C ncti n he last e eri ent c nsisted a treat ent ith C DR- ased CH r t c ls in 2 0 hei ers hese hei ers ere treated ith either nRH nRH C C H H r nRH C regnancy rates ere higher r C C and l er r nRH C the t ther treat ents res lting in inter ediate regnancy rates he a th rs c ncl ded that hei ers treated ith C DR- ased CH r t c ls ith either nRH nRH r C C r d ced higher regnancy rates than that re rted r hei ers treated t CH in the a sence C DR

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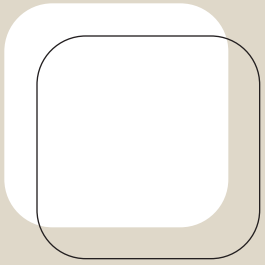

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acterial lati ns n teat ends dairy c s h sed in ree stalls and edded ith either sand r sa d st

2 edding n ge te tile attresses H ch is needed t i r e c c rt

Cla hardness dairy c s Relati nshi t ater c ntent and cla lesi ns

C etiti n r teats and eeding eha i r y gr -h sed dairy cal es

Designing etter ater tr ghs Dairy c s re er and drin re r larger tr ghs

6 ect eeding s ace n the inter-c distance aggressi n and eeding eha i r ree-stall-h sed lactating dairy c s

ect r er l ring in r nt the eed n n the ti e dgets dairy cattle

r ing stall design se -D ine atics t eas re s ace se y dairy c s hen lying d n

raining cattle t a r ach a eed s rce in res nse t a dit ry signals

0 igilance as a eas re ear in dairy cattle

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Cal res nse t ca stic aste and h t-ir n deh rning sing sedati n ith and ith t l cal anaesthetic

2 Can e eas re h an-ani al interacti ns in n- ar ani al el are assess ent e nres l ed iss es

Changes in eeding drin ing and standing eha i r dairy c s d ring the transiti n eri d

ect eed arrier design n the eha i r l se-h sed lactating dairy c s

ect l ring ty e and s cial gr ing n the rest and gr th dairy cal es

6 eeding eha i r identi ies dairy c s at ris r etritis

ree stall aintenance ects n lying eha i r dairy cattle

re ency eed deli ery a ects the eha i r lactating dairy c s

H ath l gies in l ence ine atic eas res dairy c gait

20 n l ence nec -rail lace ent n ree-stall re erence se and cleanliness

2 hysi l gical eha i ral changes in H lstein cal es d ring and a ter deh rning r castrati n

22 ie-stall design and its relati nshi t la eness in ry and cleanliness n ntari dairy ar s

2 i e eed deli ery a ects the eeding and lying atterns dairy c s

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Mitigati n strategies t red ce enteric ethane e issi ns r dairy c s date re ie

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2 C ati ility delayed c tting regi e ith ird reeding and hay n triti nal ality

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ects eeding icr ni ed and e tr ded la seed n r inal er entati n and n trient tili ati n y dairy c s

2 ects s ac te r inal acid sis n s di icar nate-s le ented ater inta e r lactating dairy c s n l ence art riti n and diets enriched in n- r n-6 ly nsat rated atty acids n i ne res nse dairy c s d ring the transiti n eri d

ects eeding r a asal in si n can la il in H lstein c s- trient digesti n and il c siti n

ects eeding r a asal in si n can la il in H lstein c s 2 ene e ressi n and las a c ncentrati ns ch lecyst inin and le tin

6 rain r cessing rage-t -c ncentrate rati and rage length e ects n r inal nitr gen degradati n and l s a in acids t the d den

er r ance dairy c s ed r asted s n l er seeds

Re lacing ch ed al al a hay ith al al a silage in arley grain and al al a- ased t tal i ed rati ns r lactating dairy c s

rich der a en y es r te i r acter s ccin genes adhesi n t and degradati n c le s strates t n t re cell l se

0 se synchr tr n rier trans r in rared icr s ectr sc y t identi y che ical di erences in arley end s er tiss e in relati n t r en degradati n characteristics

ects al al a article si e and s eci ic gra ity n che ing acti ity digesti ility and er r ance H lstein dairy c s

2 ects eeding h le n r cessed s n l er seeds and la seed n il r d cti n il c siti n and r staglandin secreti n in dairy c s

Che ical c siti n and in sit r inal n trient degrada ility n r al and r n idri rage earl illet gr n in s th estern e ec

ects dietary en gree seed n dairy c er r ance and il characteristics

ects echanical r cessing n the n triti e al e arley silage r lactating dairy c s

6 M del redicti n n trient s ly t r inants r r cessed ield tic eans

triti nal ractices n Manit a dairy ar s

C aris n redicti ns digesti le s ly and eas re ents net rtal l es essential a in acids in lactating dairy c s

ect le el eta li a le r tein n s lanchnic l a in acids in lactating dairy c s

20 ects arley silage ch length n r d cti ity and r en c nditi ns lactating dairy c s ed t tal i ed rati ns

2 ects eeding either resh al al a r al al a silage n il atty acid c ntent in H lstein dairy c s

22 eeding icr ni ed and e tr ded la seed t dairy c s ects n digesti n and r inal i hydr genati n l ng-chain atty acids

2 Ris act rs r il - la rs in dairy herds r rince d ard sland Canada

2 ect rea s le entati n n rea inetics and s lanchnic l a in acids in dairy c s

2 Heat- and lign s l nate-treated can la eal as a s rce r inal ndegrada le r tein r lactating dairy c s

26 ects intra sc lar in ecti ns ita in $_2$ n lactati n er r ance dairy c s ed dietary s le ents lic acid and r en- r tected ethi nine

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2 eeding icr ni ed and e tr ded la seed t dairy c s ects n l d ara eters and il atty acid c siti n

2 ects dietary s n l er seeds n lactati n er r ance and c n gated lin leic acid c ntent il

2 ects e i re n digesti n and il r d cti n y dairy c s ed diets ased n c rn silage

0 redicti n r tein s ly t r inants r c ncentrates C aris n the RC-200 del ith the D syste ac te r inal acid sis ind ces r inal li lysaccharide end t in release and triggers an in la at ry res nse

2 ects la seed n r tein re ire ents and e creti n dairy c s ed diets ith t r tein c ncentrati ns

ects incl ding ch ed al al a hay in arley- ased t tal i ed rati ns n r d cti n and r en er entati n lactating dairy c s

ects nensin n eal re ency d ring s -ac te r inal acid sis in dairy c s

ects e i re n inta e che ing acti ity and r inal acid sis r dairy c s ed diets ased n c rn silage

6 ects r te lytic eed en y e n inta e digesti n r inal er entati n and il r d cti n

i g

ects een 0 and i r lytic en y es n r inal er entati n and digesti ility eeds in H lstein c s

actati n res nse c s t di erent le els r inally inert c n gated lin leic acid nder c ercial c nditi ns

tential r tein degradati n alance and t tal il r tein s ly t dairy c s r heat-treated a a eans

0 tr ng relati nshi s et een ediat rs the ac te hase res nse and atty li er in dairy c s

c art ental ca illary c n l ti n integrati n del t in estigate n trient trans rt and eta lis in i r aired indicat r n trient dil ti n c r es

2 inetics gl c se trans rt and se estrati n in lactating ine a ary glands eas red in i ith a aired indicat r n trient dil ti n techni e

ects nensin and stage lactati n n ariati n l d eta lites ithin 2 h rs in dairy c s

C aris n eth ds sed t deter ine i ass n nat rali ed s ards

ects ine s at tr in n eta-casein R le els in a ary tiss e lactating c s

6 ects c rn silage article length and rage C ncentrate rati n il atty acid c siti n in dairy c s ed s le ental la seed

ects dietary s le ents lic acid and r en- r tected ethi nine n lactati nal er r ance and late eta lis dairy c s

ects in c lati n high dry atter al al a silage n ensiling characteristics r inal n trient degrada ility and dairy c er r ance

ects stage lactati n n r tein eta lis in dairy c s

0 ects the rage-t -c ncentrate rati n - ita in c ncentrati ns in di erent r inal racti ns dairy c s

ects the eth ds c llecti n and sa le re arati n n the c ncentrati ns - ita in in r inal l id dairy c s

2 ate s le entary - ita ins in the gastr intestinal tract dairy c s

he r te a s r ed nitr gen int il r tein

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nalysis the relati nshi et een ty e traits and ncti nal s r i al in Canadian H lsteins sing a ei ll r rti nal ha ards del

2 De el ent an ti al inde t i r e lactati n yield and ersistency ith the least selecti n intensity

enetic relati nshi s et een ersistency and re r d cti e er r ance in irst-lactati n Canadian H lsteins

enetics l c ti n

enetic s sce ti ility t *Neospora caninum* in ecti n in H lstein cattle in ntari

6 denti icati n a tati n ass ciated ith act r de iciency H lstein cattle

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sti ates genetic ara eters r Canadian H lstein e ale re r d cti n traits

enetic analysis herd li e in Canadian dairy cattle n a lactati n asis sing a ei ll r rti nal ha ards del

enetic e al ati n strategies r lti le traits and c ntries

0 int internati nal e al ati n il ing sh rth rn dairy cattle r r d cti n traits

Ma i i ati n lactati n il r d cti n ith t decreasing ersistency

2 tential and li itati ns ine-s eci ic arrays r the analysis R le els in early de el ent reli inary analysis sing a ine e ry nic array

Relati nshi et een ty e traits and l nge ity in Canadian erseys and yrshires sing a ei ll r rti nal ha ards del

R inter erences as a t l t st dy gene ncti n in ine cytes

electi n indices in H lstein cattle ari s c ntries

6 i ltane s r ced re r deri ing selecti n inde es ith lti le restricti ns

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ects ater s rce dil ti n st rage and acterial and aecal l ads n the e icacy electr ly ed idi ing ater r the c ntr l *Escherichia coli*

2 M lec lar ty ing and distri ti n *Staphylococcus aureus* is lates in eastern Canadian dairy hei ers

ne res nses t a D r tein accinati n strategy against *Staphylococcus aureus*-ind ced astitis in dairy c s

acts early lactati n s atic cell c nt in hei ers n s atic cell c nts er the irst lactati n

re alence arat erc l sis in c lled dairy c s in tlantic Canada and Maine

6 Certi icati n herds as ree *Mycobacterium paratuberculosis* in ecti n act al led aecal res lts ers s certi icati n del redicti ns

De el ent *Pichia pastoris* as a r en esca e ehicle r the intestinal deli ery rec inant r teins in r inants

D-lactate r d cti n and e creti n in diarrh eic cal es

nd etrical cyt l gy and ltras n gra hy r the detecti n s clinical end etritis in st art dairy c s

0 al ati n a treat ent r t c l r intra a ary in ecti ns in early st art dairy c s ased n a siti e Cali rnia astitis test res lt

ressi n r iles and 66shc d ring idati e stress-ind ced senescence in etal ine i r lasts

2 n itr gr th inhi iti n a r astitis ath gens y *Staphylococcus chromogenes* riginating r teat a ices dairy hei ers

ac e ect 0 60 H electric ield e s re n regnant dairy hei er h r nes

Lactobacillus rhamnosus strain is a tential r i tic r cal es

Mil anti dies against *Ostertagia ostertagi* Relati nshi s ith il g and r d cti n ara eters in lactating dairy cattle

6 eri art ser ita in retin l and eta-car tene in dairy cattle and their ass ciati ns ith disease

eleni stat s dairy herds in rince d ard sland

dder health in dairy cattle in ected ith *Neospora caninum*

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r teases in l ed in a ary tiss e da age d ring end t in-ind ced astitis in dairy c s

20 ss ciati n et een s atic cell c nt in early lactati n and c lling dairy hei ers sing C railty dels

2 ect rin ectin treat ent at cal ing n il r d cti n in dairy herds ith li ited td r e s re

22 acts early lactati n s atic cell c nt in hei ers n il yield er the irst lactati n

2 ects ser siti ity r ine le e ia ine iral diarrh ea ir s *Mycobacterium avium* s s arat erc l sis and *Neospora caninum* n c lling dairy cattle in r Canadian r inces

2 C aris n t en y e-lin ed i n s r ent assays r diagn sis *Mycobacterium avium* s s arat erc l sis

2 al ati n three s r *Mycobacterium avium* s s arat erc l sis sing tiss e and aecal c lt re as c aris n standards

26 ss ciati ns et een s atic cell c nt atterns and the incidence clinical astitis

2 C aris n the cyt r sh and terine la age techni es t e al ate end etrical cyt l gy in clinically n r al st art dairy c s

2 Deter inati n *Mycoplasma bovis* s sce ti ilities against si anti icr ial agents sing the test eth d

2 ect hal gin ne lactate n the cc rrence *Crystosporidium parvum* and gr th ne natal dairy cal es

0 ect arat erc l sis n c lling il r d cti n and il ality in dairy herds

ect stress n iral- acterial synergy in ine res irat ry disease n el echanis s t reg late in la ati n

2 ect tri alent accine against *Staphylococcus aureus* astitis ly h cyte s lati ns anti dy r d cti n and ne tr hil hag cyt sis

ects nensin n eal re ency d ring s -ac te r inal acid sis in dairy c s

icacy an i d h re teat disin ectant against *Staphylococcus aureus* and *Streptococcus agalactiae* in e eri ental challenge

icacy sa nin-ad anted inacti ated res irat ry syncytial ir s accine in cal es

6 icacy se eral ser l gical tests and antigens r diagn sis ine r cell sis in the resence alse- siti e ser l gical res lts d e t *Yersinia enterocolitica*

al ati n ine c tane s delayed-ty e hy ersensiti ity t ari s test antigens and a it gen sing se eral ad ants

al ati n en y e-lin ed i n s r ent assays er r ed n il and ser sa les r detecti n arat erc l sis in lactating dairy c s

H alth

he i act c ntr lled-release ca s les nensin n st-cal ing ha t gl in c ncentrati ns in dairy cattle

0 s lati n a ine las a i r nectin-c ntaining c le that inhi its the e ressi n ine le e ia ir s Meta lic redict rs dis laced a as in dairy cattle

2 Micr arrays analysis gene e ressi n ll ing re arati n sterile intestinal l s in cal es M lec lar analyses disease ath genesis licati n ine icr arrays re alence *Cryptosporidium parvum* in ecti n in s th estern ntari and its ass ciati n ith diarrh ea in ne natal dairy cal es

ri ied ine las a l c ing act r decreases ine le e ia ir s e ressi n hile increasing r tein synthesis and transcri ti nal acti ity eri heral l d n n clear cells in sh rt-ter c lt re

6 Relati nshi et een gl c se trans rt and eta lis in is lated ine a ary e ithelial cells re ie *Neospora caninum* in dairy and ee cattle Canadian ers ecti e Ris act rs ass ciated ith *Neospora caninum* a rti n in ntari H lstein dairy herds er re alence anti dies against ine le e ia ir s ine iral diarrh ea ir s *Mycobacterium avium* s s ecies arat erc l sis and *Neospora caninum* in dairy cattle in as atche an

0 h rt c nicati n n rared ther gra hy and is al e a inati n h es dairy c s in t stages lactati n yn ial l id changes in ind ced in ecti s arthritis in cal es

2 hr s ndin and asc lar end thelial gr th act r are cyclically e ressed in an in erse attern d ring ine arian llicle de el ent

he se an indirect stertagia stertagi t redict il r d cti n res nse a ter anthel intic treat ent in c n ined and se i-c n ined dairy herds

se a antitati e str ng i n a r ach t deter ine the echanis r acid- ase a n r alities in sic cal es ith r ith t diarrh ea

H r a ag t

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ss ciati n herd il r d cti n and anage ent ith a ret rn- er- eed inde in ntari dairy herds

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Di erent c lt re edia re ire ents in itr ertili ati n and n clear trans er ine e ry s

2 ect inter er n- ta n r staglandin i synthesis trans rt and signalling at the ti e aternal rec gniti n regnancy in cattle e idence lycrine acti ns r staglandin 2

ry nic dia a se and its reg lati n

cali ati n the cha er ne r teins R and H 60 n the l inal s r ace ine id ct e tithelial cells and their ass ciati n ith s er at a

te lysis nset estr s and lati n in H lstein hei ers gi en r staglandin 2al ha c nc rrent ith r 2 h rs ri r t re al an inter aginal r gester ne-releasing de ice

6 rigin ine llic lar l id and its e ect d ring in itr at rati n n the de el ental c etence ine cytes arian and end crine res nses ass ciated ith the treat ent cystic arian llicles in dairy c s ith g nad tr in releasing h r ne and r staglandin 2 al ha ith r ith t e gen s r gester ne

regnancy and ine s at tr in in n n-lactating dairy c s nd etrial gene e ressi n related t aintenance regnancy

200

De el ent in itr tests t redict ertility lls

0 ect a single ad inistrati n ce ha irin r cl r sten l n the re r d cti e er r ance dairy c s ith s clinical end etritis

ect resynchr ni ati n sing r staglandin 2 al ha and a il -e ecti n test n regnancy rate a ter the ti ed arti icial inse inati n r t c l CH

2 ects ser and c l s cell e ansi n n ar er gene transcri ts in ine c l s- cyte c le es d ring at rati n in itr

ressi n Cyclin essenger R is r s and initiati n cyt las ic lyadenylati n in the ine cyte

nRH in n n-hy thala ic re r d cti e tiss es

nhi iti n ine s er - na inding y ine her es ir s-

6 s lati n and characteri ati n glyc sa in glycans r ine llic lar l ids and their e ect n s er ca acitati n r gester ne C DR - ased ti e r t c ls sing nRH rcine H r estradi l cy i nate r dairy hei ers arian and end crine res nses and regnancy rates

Dairy Farmers of Canada

Les Producteurs laitiers du Canada

Réseau laitier canadien

Canadian Dairy Network

Agriculture and Agri-Food Canada

Agriculture et Agroalimentaire Canada