NE-1048 Multi State Research Project Annual Meeting
Mastitis Resistance to Enhance Dairy Food Safety
Annual Business Meeting
Memphis, TN
February 4, 2015

1. The 2015 (FY15) annual business meeting of the NE 1048 Multistate research project was called to order at 5:00 pm by Pedram Rezamand.

2. Copies of the FY14 business meeting minutes were distributed. A motion for approval was seconded and the FY14 business meeting minutes were approved by unanimous vote.

3. Introduction of members and new members:
   Attending members introduced themselves.

   Members present: 14 stations represented

Pedram Rezamand	Idaho	University of Idaho
Sharif Aly	California	University of California, Davis
Jeffery Bewley	Kentucky	University of Kentucky
Bill Owens	Louisiana	Louisiana State University
Kasey Moyes	Maryland	University of Maryland
Ron Erskine	Michigan	Michigan State University
Sandra Godden	Minnesota	University of Minnesota
John Middleton	Missouri	University of Missouri
Simon Dufour	Other	University of Montreal
Greg Keefe	Other	University of Prince Edward Island
Chris Luby	Other	University of Saskatchewan
Gina Pighetti	Tennessee	University of Tennessee
Christina Petersson-Wolfe	Virginia	Virginia Tech
Larry Fox	Washington	Washington State University
John Barlow	Vermont	University of Vermont

4. No new members were added. There was brainstorming as to who else might be invited to join the group and the Chair agreed to contact those people.

5. There was no Project Administrator's report.

6. Kasey Moyes was nominated to serve as NE1048 secretary, agreed to accept the nomination, and was elected.

7. The 2016 NE1048 meeting will again piggyback onto the NMC meeting. Considerable discussion occurred about future meeting locations.

8. Seeing no other business the meeting was adjourned after a motion and second.

NE-1048 ANNUAL REPORT WORKSHEET (FY14)

Complete the form and email as an attachment to:

Pedram Rezamand at rezamand@uidaho.edu

Year: 10/01/2013 to 09/30/2014 Station: _____

E-mail address of submitter of this form: _____

Technical Members for this station (please submit 1 member name per line):

_____

_____

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_____

Contributors:

_____

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For each of the sections below, **limit the response to 2-3 sentences (~100 words max).** A concerted effort to be brief will assure that the most pertinent accomplishments will be included in the annual report. If a study was done in collaboration with another station, indicate the station abbreviation in parentheses after the sentence describing the study. For information on these objectives see : http://nimss.umd.edu/homepages/home.cfm?trackID=13717

OBJECTIVE 1: Characterization of host mechanisms associated with mastitis susceptibility and resistance.

Michigan continued to study the impact of negative energy balance and fat mobilization on vascular endothelial and adipose inflammatory responses in vitro by changing the expression of important inflammatory mediators. In particular, the role of n-3 fatty acid content in altering the profile of vasoactive eicosanoids and the role of poly-unsaturated fatty acids on attenuating endothelial cell inflammatory responses, as well as lymphocyte expression of pro-inflammatory cytokines was a central aim of our work (MI). Utah's data collection is complete, analysis is ongoing for comparison of bovine whole genome analysis for SNP detection between cows

repeatedly mastitic vs. cows continually free of mastitis. Preliminary bioinformatics is detecting many genetic SNP combinations more common among mastitis-resistant cows and others more common among mastitis-susceptible cows. Utah will finalize analysis of the bovine genome mastitis-related SNP study (UT). Vermont is using dermal fibroblast cultures to model cow-to-cow variation in mastitis severity following experimental challenge. Some relation is apparent between the in vitro responses to stimulation with bacterial components and the *in vivo* responses to experimental challenge with mastitis causing pathogens. Vermont is now examining epigenetic contributions to the differential responses (VE). Virginia has complemented their previous *in vitro* studies characterization T cell responses to dendritic cells presenting *S. aureus* antigens using *in vivo* challenge models. Specifically, they challenged cows with intramammary infusion of S. aureus and tracked immune responses through analysis by flow cytometry of milk immune cells. Virginia is currently compiling data and finding a change in T cell profiles depending on type of *S. aureus* used for challenge, suggesting an ability to manipulate SCC profiles of the mammary gland. Virginia will continue to analyze the data from their challenge study to determine the changes in cell populations following challenge with irradiated *S. aureus* and continue to explore this line of research. (VA).

OBJECTIVE 2: Characterization and manipulation of virulence factors of mastitis pathogens for enhancing host defense.

Louisiana's mastitis pathogens are cultured and identified from milk samples submitted to the laboratory from both cattle and goats. Mastitis pathogens are identified and their antimicrobial susceptibilities determined to screen mastitis pathogens for resistance to antimicrobials. Identification of mastitis pathogens from clinical milk samples will continue. Identification of mastitis pathogens from dairy goats will continue (LA).

OBJECTIVE 3: Assessment and application of new technologies that advance mastitis control, milk quality and dairy food safety.

Connecticut's study combined functional metagenomics with third-generation PacBio sequencing of bacteria in manure of dairy cows administered intramammary B-lactam antibiotic treatment for mastitis and cows with no intramammary infection or treatment. Functional screening of fosmid and small-insert libraries identified 80 different antibiotic resistance genes whose deduced protein sequences were on average 50 to 60% identical to sequences deposited in GenBank. In addition, a novel clade of chloramphenicol acetyltransferases were identified. In addition, ultrasound scanning to monitor changes in mammary quarters following a clinical mastitis infection demonstrated that ultrasound scanning abnormalities accurately predicted the persistence in elevated SCC within the recovering quarters with a correlation of .80 (CT). Connecticut will continue validation of ultrasound detection of mastitis by necropsy and mammary quarter parenchyma histology and microbiological examination of ultrasound scanning areas of that are indicative of abnormalities and no abnormalities to determine the sensitivity, specificity and positive predictive prevalence of ultrasound for the detection of mastitis and/or abnormal mammary quarters (CT). The University of Kentucky has been working on a study to examine the potential for multiple precision dairy technologies used in mastitis

detection. Additionally, multiple decision support tools have been developed to examine mastitis economics. A study was completed comparing mastitis in compost bedded pack barns to sand Freestall barns. Kentucky will continue assessment of precision dairy technologies and development of decision support tools (KY). Novel food grade products are being evaluated using the modified AOAC test and the excised teat model to determine their suitability for teat dips and disinfectants (LA). As part of a multistate USDA-NIFA funded project, Michigan is developing an on-farm evaluation system for milk quality and reduction of antibiotic use. The evaluation system (Quality Milk Alliance) will bring together traditional management assessment related to mastitis control as well as a novel integration with understanding social and communication barriers to change on the part of dairy producers and employees (MI). At the Missouri station, molecular techniques (gene sequencing, metagenomics & strain-typing) are being applied to the understanding of coagulase negative staphylococcal (CNS) mastitis in dairy heifers. Various species of staphylococci have been isolated from heifer body sites, pre-partum secretions, and post-partum milk samples. Overall, Staphylococcus chromogenes was the most common species identified in pre-partum secretions (17.8%, 15/84) and post-partum milk samples (16.7%, 14/84). The most common species identified on body sites included *S. devriesei* (34%, 100/298), *S. chromogenes* (32%, 96/298), and *S. haemolyticus* (23%, 68/298). This work will continue into the next fiscal year (MO). Additionally, work has begun using similar methodologies to understand the epidemiology of coagulase negative *staphyococcal* mastitis in dairy goats. To date, 940 goats have been sampled and 216 CNS isolates collected for further study (MO). Utah completed a statewide prevalence study for Johne's disease (JD), mycoplasma mastitis, and Bovine Viral Diarrhea in Utah. Repeated bulk tank testing and some individual cow follow up testing were used. Comparing to past results for the region and for individual herds, the percentage of herds becoming newly test-positive, becoming newly test-negative, or with unchanged status for JD and mycoplasma mastitis over time were calculated. (BVD had not been tested for statewide in the past.) Utah will study a mammary gland involution product with preliminary indication that creating a non-milking quarter from a mastitic quarter can be done with minimal production loss and without lasting damage following subsequent calving (UT). Virginia is continuing their work in the area of disease detection with the use of daily milk component and animal activity monitoring. In the past year, they completed a study examining changes in milk components and animal activity in early lactation for animals that experienced naturally-occurring mastitis. Virginia's results show changes in rest bouts, rest time, step activity and milk yield prior to onset of clinical signs. Early detection of disease may lead to reduced economic losses associated with mastitis. Virginia also completed a study that looked at the changes in animal activity around the onset of naturally-occurring diseases in the transition period. Virginia will continue their work in this area and furthermore, will look at the use of NSAIDs during naturally-occurring disease (VA).

PUBLICATION LIST: use as much space as necessary to complete the publication list below.

Peer-Reviewed Literature

Connecticut:

Wichmann F, Udikovic-Kolic N, Andrew S, Handelsman J. 2014. Diverse antibiotic resistance genes in dairy cow manure. mBio 5(2):e01017-13. doi:10.1128/mBio.01017-13

Michigan:

Kabara, E. L.M. Sordillo, S. Holcombe, and G.A. Contreras. 2014. Adiponectin links adipose tissue function and monocyte inflammatory responses during bovine metabolic stress. Comp. Immunol. Microbiol. Infect. Dis. 37:49-58.

Mattmiller, S.A., B.A. Carlson, J.C. Gandy, and L.M. Sordillo. 2014. Reduced macrophage selenoportein expression alters oxidized lipid metabolite biosynthesis from arachidonic and linoleic acid. J. Nutr. Biochem. 25: 647-654.

Raphael, W., L. Halbert, G.A. Contreras, and L.M. Sordillo. 2014. Association between polyunsaturated fatty acid-derived oxylipid biosynthesis and leukocyte inflammatory marker expression in periparturient dairy cows. J. Dairy Sci. 97: 3615-3625.

Missouri:

Calcutt MJ, Foecking MF, Hsieh HY, Perry J, Stewart GC, Middleton JR. 2013. Genome sequence analysis of Staphylococcus equorum bovine mastitis isolate UMC-CNS-924. Genome Announc. Oct 17;1(5). pii: e00840-13. doi: 10.1128/genomeA.00840-13.

Calcutt MJ, Foecking MF, Hsieh HY, Perry J, Stewart GC, Middleton JR. 2013. Draft genome sequence of Staphylococcus simulans UMC-CNS-990, isolated from a case of chronic bovine mastitis. Genome Announc. Dec 12;1(6). pii: e01037-13. doi: 10.1128/genomeA.01037-13.

Fry PR, Middleton JR, Dufour S, Perry J, Scholl D, Dohoo I. 2014. Association of coagulase negative staphylococcal species, mammary quarter milk somatic cell count, and persistence of intramammary infection in dairy cattle. J Dairy Sci. 97(8):4876-4885. [Epub ahead of print 12 Jun 2014].

Fry PR, Calcutt MJ, Foecking MF, Hsieh HY, Suntrup D, Perry J, Stewart GC, Middleton JR. 2014. Draft genome sequence of Staphylococcus chromogenes MU-970 isolated from a case of chronic bovine mastitis. Genome Announc. August 14;2(4). pii: e00835-14. doi: 10.1128/genomeA.00835-14.

Calcutt MJ, Foecking MF, Fry PR, Hsieh HY, Perry J, Stewart GC, Scholl DT, Messier S, Middleton JR. 2014. Draft genome sequence of bovine mastitis isolate Staphylococcus agnetis CBMRN 20813338. Genome Announc. Sept 4:2(5). pii: e00883-14. doi: 10.1128/genomeA.00883-14.

Utah:

Wilson DJ, Rood KA, Bunnell J, Whitehouse C, Byrem TM, Goodell GM: Johne's disease, mycoplasma and BVD in Utah - bulk tank milk testing and comparison to previous regional prevalence and individual herd results over time. J Veterinar Sci Technol 5:3:1-7, 2014.

Vermont:

Green, B.B., and D.E. Kerr. 2014. Epigenetic contribution to individual variation in response to lipopolysaccharide in bovine dermal fibroblasts. Veterinary Immunology and Immunopathology. 157:49-58.

Virginia:

Kanevsky-Mullarky, I., A. Nedrow, S. Garst, W. Wark, M. Dickenson, C. Petersson-Wolfe and R. Zadoks. 2014. Comparison of virulence factors in Klebsiella pneumonia strains associated with multiple or singles cases of mastitis. J. Dairy Sci. Apr;97(4):2213-8.

Neal S., W. Wark, S. Garst, R. James, M. McGilliard, C. Petersson-Wolfe, and I. Kanevsky-Mullarky. Impact of feeding whole as compared to cell-free colostrum on calf immune status. I. The neonatal period. J. Dairy Science. Accepted.

Books

Michigan:

Ruegg PL, RJ Erskine and DE Morin. 2014. Mammary Gland Health. In Large Animal Internal Medicine, 5th edition, BP Smith, editor, pp. 1015-1043.

Abstracts

Kentucky:

Lowe, J.L., K.A. Akers, A.E. Sterrett, J.D. Clark, and J.M. Bewley. 2014. Case study: Effect of alley floor scraping frequency on environmental mastitis-causing pathogen counts. Abstract 29. American Dairy Science Association Annual Meeting. Kansas City, MO.

Nolan, D.T. and J.M. Bewley. 2014. A decision support tool to estimate the economic potential of SCC hot sheet data. Abstract 289. American Dairy Science Association Annual Meeting. Kansas City, MO.

Eckelkamp, E.A., J. L. Taraba, R. J. Harmon, K. A. Akers, and J.M. Bewley. 2014. Somatic cell counts, mastitis infection prevalence, and mastitis pathogen distribution in compost bedded pack and sand freestall farms. Abstract 557. American Dairy Science Association Annual Meeting. Kansas City, MO.

Nolan, D.T., M.J. Bakke, and J.M. Bewley. 2014. Comparison of milk components before and after passing through a novel inline milk filter. Abstract 1504. American Dairy Science Association Annual Meeting. Kansas City, MO.

Sterrett, A.E., B.A. Wadsworth, K. Akers, J.D. Clark, C.L. Wood, K.J. McQuerry, R.J. Harmon, L.M. Arnold, W.J. Silvia, and J.M. Bewley. 2014. Milk yield, reticulorumen temperature, rumination time, and neck activity changes around mastitis. Abstract 62. NMC Regional Meeting

Missouri:

Webster RN, Finger AM, Fry PR, Middleton JR. 2014. Identification of coagulase-negative *Staphylococcus species* in dairy heifer calves and their environments. MU Life Sciences Week. April 14-19, 2014.

Finger AM, Webster RN, Fry PR, Middleton JR. 2014. Identification of coagulase-negative *Staphylococcus* species in dairy heifer calves and their environments. Phi Zeta Research Day. May 9, 2014. Columbia, MO. Abstract #2.

Fry PR, Middleton JR, Fox LK. 2014. Identification of *Staphyococcus aureus* genotype B among staphylococci isolated from cases of subclinical bovine mastitis in the USA. Phi Zeta Research Day. May 9, 2014. Columbia, MO. Abstract #12.

Fry PR, Middleton JR, Fox LK. 2014. Genotyping staphylococci from cases of subclinical mastitis previously identified as *Staphylococcus hyicus*. *J Vet Int Med* 28(3):1127.

Walljasper N, Fry PR, Middleton JR. 2014. Understanding Coagulase-negative Staphylococcal Mastitis in Dairy Heifers. Veterinary Research Scholars Symposium, Cornell University, Ithaca, NY. July 31 – August 3.

Cline T, Fry PR, Ericsson A, Middleton JR. 2014. Comparison of Milk and Udder Skin Microbiota of Dairy Heifers. Veterinary Research Scholars Symposium, Cornell University, Ithaca, NY. July 31 – August 3.

Vermont:

Kerr, D.E. 2014. Understanding animal-to-animal variation in disease management. ADSA-ASAS Joint Annual Meeting (JAM). Kansas City, MO.

Green, B.B., S.D. McKay, and D. E. Kerr. 2014. Age dependent changes in heifer fibroblast DNA methylation and LPS-induced gene expression. ADSA-ASAS Joint Annual Meeting (JAM). Kansas City, MO.

Benjamin, A.L., W.J. Weber, S.D. McKay, B.A. Crooker, and D.E. Kerr. 2014. Investigating innate immune response differences between Angus and Holstein cattle with the dermal fibroblast model. ADSA-ASAS Joint Annual Meeting (JAM). Kansas City, MO.

Elsasser, T.H., S. Kahl, D.E. Kerr, E. Zudaire, and F. Cuttitta. 2014. Proinflammatory Responses of a hTERT-Transformed, Immortalized Line of Cultured Bovine Mammary Epithelial cells (BME). ADSA-ASAS Joint Annual Meeting (JAM). Kansas City, MO.

Conference Proceedings

Michigan:

Erskine, R.J. and J.R. Middleton. 2014. Failure of Mastitis Therapy: Is it the Bugs, Drugs, or Us? Shortcourse presented at the 53rd Annual Mtng National Mastitis Council, Ft Worth, TX, January.

Erskine, R.J. 2014. Don't Forget Antibiotic Residues….and Other Related Topics. Great Lakes Regional Dairy Conference, Mt Pleasant, MI, February.

Erskine, R.J. 2014. Who is Making the Treatment Decisions on the Dairy Farm? Michigan Dairy Industry Conference, Frankenmuth, MI, May.

Erskine, R.J. and J.R. Middleton. 2014. Failure of Mastitis Therapy: Is it the Bugs, Drugs, or Us? Shortcourse presented at the Regional Mtng National Mastitis Council, Ghent, Belgium, August.

Sordillo, L.M. 2014. Immunity and Mastitis. Presented at the Regional Mtng National Mastitis Council, Ghent, Belgium, August.

Missouri:

Fry PR, Middleton JR, Fox LK. 2014. Genotyping staphylococci from cases of subclinical mastitis previously identified as *Staphylococcus hyicus*. Proc. 53rd Annual Meeting of the Natl. Mast. Counc. Fort Worth, TX. Jan 26-28, 2014. pp. 171-172.

Utah:

Wilson DJ, Goodell GM: Comparison of beta-hydroxybutyrate determination by Fossomatic milk analysis to milk and blood tests in postpartum dairy cattle. Proc 46th Ann Conv Am Assoc Bov Pract: 191, 2013.

Wilson DJ, Goodell GM: Beta-hydroxybutyrate diagnosis of ketosis in periparturient dairy cattle: comparison of blood and multiple milk test methods for concordance and prevalence estimates in the same population of cows. Proc 56th Ann Conf Am Assoc Vet Lab Diag: 47, 2013.

Wilson DJ: Johne's disease, mycoplasma and BVD surveillance of Utah dairy herds and changes in herd infectious status over time. Proc Utah Vet Med Assoc: 1-11, 2014.

Virginia:

Schexnayder, S., L. E. Garkovich, J. M. Fly, P. D. Krawczel, C. S. Petersson-Wolfe J. M. Bewley, S. C. Nickerson, S. Hill Ward, G. M. Pighetti, R. A. Almeida, L. M. Arnold, D. M. Amaral-Phillips, A. DeVries and S. P. Oliver. 2014. Southeast Quality Milk Initiative: Producers' Experiences, Perceptions, and Attitudes about Mastitis and Bulk Tank SCC Management. National Mastitis Council Annual Meeting, Fort Worth, TX.

Griffith A., M. McGilliard, and C. S. Petersson-Wolfe. 2014. Changes in Activity and Milk Components Around Onset of Clinical Mastitis. National Mastitis Council Annual Meeting, Fort Worth, TX.

Garst, S. N., C. S. Petersson-Wolfe and I. Kanevsky-Mullarky. 2014. Gamma-Irradiated Staphylococcus aureus Fails to Protect Against Subsequent Intramammary Infection. National Mastitis Council Annual Meeting, Fort Worth, TX.

Pighetti, G. M., S. P. Oliver, R. A. Almeida, P. D. Krawczel, J. M. Fly, S. M. Schexnayder, C. S. Petersson-Wolfe, J. M. Bewley, L. E. Garkovich, D. M. Amaral-Phillips, L. M. Arnold, S. C. Nickerson, S. Hill Ward and A. DeVries. 2014. Southeast Quality Milk Initiative: Milk Quality in the Southeast USA. National Mastitis Council Annual Meeting, Fort Worth, TX.

Poster Presentations

Connecticut:

Alexander, E., J. Riesen, and S. Andrew. 2014. Validation of ultrasound as a viable technology for the detection of mastitis. University of Connecticut Frontiers in Undergraduate Research. April 9-10, 2014.

Michigan:

Contreras, G.A. and R.J. Erskine. 2014. On-farm employee education programs, empowering milk quality teams. Poster presented at the Regional Mtng National Mastitis Council, Ghent, Belgium, August, 2014.

Virginia:

Lehtimaki M., W. Wark, I. Kanevsky-Mullarky. 2014. Lymphocyte response to Staphylococcus aureus secreted factors lead to interferon gamma production and neutrophil activation. 30th Annual Graduate Research Symposium. Blacksburg VA.

Undergraduate Honor's Thesis

Alexander, E. 2014. Validation of Ultrasound as a Viable Technology for the Detection of Mastitis in Dairy Cattle. University of Connecticut Undergraduate Honor's Thesis.