

U.S. Department of Agriculture Work Unit Description AD-416 U.S. Dept. of Agriculture, State Agricultural Experiment Stations and Other Institutions				Date (Month/Day/Year) 06/21/2012
1. Accession No.	Agency Identifiers		5. Work Unit/Project No.	6. Status
	2. NIFA	3. LA.B	LAB94151	A = New Project
7. Title Mastitis Resistance to Enhance Dairy Food Safety				
8. Performing Organization 0761 - 2010 Hill Farm Research Station Agricultural Experiment Sta, Louisiana State Univ			9. Cooperating Departments within State Performing Institution	
10. Multistate Project No. NE1048			11. Cooperating States <small>sent via EFTS electronic transfer</small>	
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14. Project Type Hatch/Multistate	15. Contract/Grant/Agreement No.		16. Amount	17. FY
18. Award Date (Month/Day/Year)		19. Start Date (Month/Day/Year) 10/01/2012		20. Termination Date (Month/Day/Year) 09/30/2017
Goals/Objectives/Expected Outputs Objective 2: Characterization and manipulation of virulence factors of mastitis pathogens for enhancing host defenses. A major achievement for this objective is the continued examination of the role of coagulase-negative staphylococci on mastitis. More detailed examination of this diverse group of bacteria, including genotypic identification, has revealed that different species have surprisingly different effects on pathogenesis. Some species cause little or no decline in milk production. Additional progress is being made on using PCR-based techniques to identify pathogens in high SCC milk that had previously been declared as no growth using traditional culture techniques. This will be of great, widespread importance in mastitis treatment and research. Continued work exploring the development of bacterial resistance to commonly used antimicrobials is providing needed information on this critical treatment of mastitis. Antimicrobial resistance patterns of bovine and human isolates appear similar, and recent work suggests that mastitis therapeutics do not seem to induce or select for resistant bacteria. Additional achievements include further identification of pathogen virulence factors and their association with mastitis pathogenesis, and detailed in vitro studies on bacterial adherence to, and penetration into mammary epithelial cells. Objective 3: Assessment and application of new technologies that advance mastitis control, milk quality, and dairy food safety. Achievements include evaluation of <i>S. aureus</i> and <i>E. coli</i> mastitis vaccines; development and application of milk residue testing; development of control programs for <i>S. aureus</i> and <i>Mycoplasma</i> spp.; evaluation of extended therapy for <i>S. aureus</i> and <i>S. uberis</i> mastitis and assessment of methods for on-farm and laboratory diagnosis of mastitis and food-borne pathogens. Improvements in diagnostic technologies include development and application of PCR to detect <i>Mycoplasma</i> mastitis; to identify and speciate pathogenic <i>Prototheca</i> (algae) as a screening technique for bulk tank filters; and to validate 16S gene sequence analysis for mastitis pathogen detection. These molecular techniques are critically important tools in mastitis treatment. Other achievements include developing and assessing techniques for evaluating milk quality in sheep and goats; and evaluation of an in-line milk analysis system for somatic cell count and other quality assessment components; and studies of colostrum quality assessment methods. Finally, several workers have reported on alternative methods of preventing (probiotic) and treating (botanical/novel intramammary infusions) mastitis.				
Methods Objective 2: Characterization and manipulation of virulence factors of mastitis pathogens for enhancing host defenses. (ii) Antimicrobial Resistance Continued monitoring of antimicrobial resistance of mastitis-causing pathogens is of utmost importance to determine if such resistance is emerging or progressing. Work in this area will be carried out at several stations (KY, LA, VT). LA and VT will continue to evaluate the impact of agricultural				

use of antibiotics on bacterial resistance to antibiotics. Comparison of resistance patterns between bovine and human associated isolates will be performed (LA). Additionally, VT will examine potential associations between carriage of antimicrobial resistance genes and response to antimicrobial therapy among different strain types of *S. aureus* and *S. uberis*. The effect of ensiling on antibiotic resistance of enterococcal isolates will be examined by VA. The minimum inhibitory concentrations of various cephalosporin compounds for several mastitis pathogens will be evaluated (WI) with the goal of improving treatment options. In addition, WI will characterize genotypic and phenotypic patterns of resistance for a large number of mastitis pathogens collected from a cross section of large Wisconsin dairy farms. Objective 3: Assessment and application of new technologies that advance mastitis control, milk quality and dairy food safety. Twenty-two stations have stated that they have been, or will be working on Objective 3-related projects, although many projects are relevant to more than one objective. Antimicrobials, including injectable and extra-label use antibiotics, will be evaluated at the Georgia station, along with a method to evaluate goat milk SCC. ID will evaluate teat dips, continue the collaboration with MN and CA studying dry cow treatments, and begin a mastitis vaccine evaluation trial. LA will assess the impact of dairy practices on antibiotic resistance in the human population.

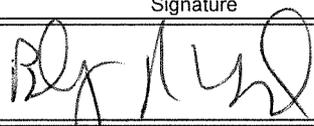
23. Non-Technical Summary

In the United States, cash receipts from marketing of milk during 2010 totaled \$31.4 billion and it is estimated that U.S. consumers spend approximately 11% of their food dollars on dairy products. However, the dairy industry continues to experience significant monetary drain through the losses associated with common diseases. Bovine mastitis is the most costly infectious disease currently affecting dairy cattle. Recent estimates suggest that economic losses due to clinical and subclinical mastitis are in the range of \$200 per cow per year. These losses are primarily due to lost milk production, increased veterinary costs, increased cow mortality, and discarded milk. While significant advances have been made in controlling some types of mastitis, the complex etiology of the disease and ongoing changes in dairy practices dictate that new and more effective methods for control and treatment be developed over time. Single site studies are often limited in terms of expertise and cattle numbers. A multi-state project provides advantages in terms of increased numbers of herds and cattle as well as multiple levels of expertise. The purpose of NE-1048 is to coordinate multidisciplinary research efforts on mastitis that are being conducted at various laboratories throughout the United States. The magnitude and scope of attempting to solve these problems extend far beyond the ability of any one institution. The ability to cooperate on a regional and national basis allows the integration of resources and knowledge to address this problem. Recognition of the need for a coordinated effort to study resistance of the dairy cow to mastitis resulted in the design and initiation of multi-State Project NE-1048. The NE-1048 project has provided a forum for new and established researchers to develop collaborative relationships, and to share resources and expertise. The NE-1048 project is comprised of three objectives 1) characterization of host mechanisms associated with mastitis susceptibility and resistance, 2) characterization and manipulation of virulence factors of mastitis pathogens for enhancing host defenses, and 3) assessment and application of new technologies that advance mastitis control, milk quality, and dairy food safety.

24. Keywords

Mastitis, antimicrobial susceptibility testing, antimicrobial resistance, teat dips

**** The Original signed document is on file at this institution. ****

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