Bovine mastitis is the most important infectious disease affecting both the quality and quantity of milk produced in the nation. On average, losses associated with mastitis will cost US dairy producers about $185 per cow each year. Mastitis will cost Michigan dairy producers approximately $50 million in lost revenues annually. Some obvious costs associated with mastitis control include medications, labor, and veterinary services. However, most of the economic losses due to mastitis are attributed to reduced milk production, discarded antibiotic-treated milk, and increased need for replacement animals.

Over the past several decades, procedures that improve milking time hygiene and reduce the exposure of udders to infectious pathogens have proven to be highly effective in reducing the incidence of some forms of mastitis. For example, prevalence of contagious pathogens such as *Staphylococcus aureus* and *Streptococcus agalactiae* has decreased considerably with the application of these good management practices. Unfortunately, the etiology (cause or origin) of mastitis has shifted over the years from contagious organisms to more environmental pathogens, even in well-managed herds. The environmental pathogens, such as *Escherichia coli* and *Klebsiella pneumoniae*, are often associated with more frequent episodes of clinical mastitis that can pose some unique challenges for eliminating existing intramammary infections (1).

Antibiotic therapy as a means to treat infections is an important part of current mastitis control programs. Historically, formulations of both lactating and dry-cow intramammary products were directed primarily against the gram-positive organisms, particularly *staphylococci* and *streptococci*. Indeed, most over-the-counter infusion products are highly effective in treating many forms of streptococcal mastitis. However, the therapeutic success rates with antibiotic therapy can vary considerably depending on the duration of infection and the specific organisms causing the infection. Chronic Staph. aureus mastitis has proven to be very difficult to eliminate during lactation using currently available intramammary treatment products due to buildup of scar tissue and abscess formation. In recent years, there also has been an emergence of mastitis-causing pathogens that have a greater resistance to antibiotic therapies, including coliforms and *Mycoplasma bovis* (2).

Despite the dire economic impact of this disease on the dairy industry, the most widely accepted method of mastitis control is the use of non-antibiotic tactics. These tactics include good management practices, early detection and treatment, and control of environmental factors that contribute to the spread of mastitis.
therapy remains intramammary antibiotic treatment. In reality, the efficacy (effectiveness) of such treatments is low during the lactation period, especially against major mastitis-causing pathogens. This method of treatment is not always cost-effective either due to discarded antibiotic-contaminated milk during and after treatment. Estimates suggest that antibiotic contaminated milk will cost the US dairy industry $50 million annually. Antibiotic residues are an undesirable consequence of controlling mastitis, and there is a growing concern from consumers over the potential presence of drug residues in the food supply. In a survey conducted by the National Dairy Board, consumers listed antibiotics as a serious health hazard in the food supply. When questioned about milk, the majority of the respondents listed chemical residues as a problem and wanted the Federal government to increase antibiotic regulation to ensure food safety (3). While the vast majority of dairy farmers use antibiotics in a responsible fashion, there are some groups who blame antibiotic usage on dairy farms for the emergence of antibiotic resistant human pathogens. It is obvious that new approaches are needed to reduce the dairy industry’s dependence on chemotherapy as its major means for reducing or eliminating existing intramammary infections.

Non-antibiotic Approaches

It is well established that the changes in incidence and severity of mastitis are related directly to changes in the composition, magnitude, and efficiency of the udder’s immune system. In order to address the future needs of the dairy industry, researchers are investigating ways to enhance the natural defense mechanisms of the udder to prevent and effectively eliminate mastitis. For example, certain immune cells (lymphocytes) in the cow’s udder are capable of secreting natural antibacterial proteins that can kill a spectrum of common mastitis-causing bacteria including coliforms, Strep. uberis, and Staph. aureus (4). Initial safety studies showed that this antibacterial protein does not adversely affect the udder, but still has potent activity against bacteria present in the milk. Further characterization of this antibacterial protein suggested that it may belong to a family of proteins that also are found in human lymphocytes called saposin-like proteins (SAPLIP). Indeed, through the use of gene databases and molecular techniques it was confirmed that a bovine homologue of SAPLIP exists in udder lymphocytes that is very similar in structure and function with human SAPLIP. Studies currently are underway at MSU’s College of Veterinary Medicine to purify large quantities of the bovine SAPLIP in order to explore ways that it could be used to control bacterial infections in dairy cattle. It is possible that this factor could be used as a natural antimicrobial agent for the therapeutic treatment of mastitis-causing pathogens. Bovine SAPLIP also may be useful in teat dip formulations for both the pre- and post-milking applications. The successful development of this new technology may have several advantages over conventional chemotherapies in eliminating mastitis, including: 1) a broad spectrum of activity to kill different bacterial species (Staph. aureus, E. coli, streptococci) without causing damage to host cells; 2) minimal contribution to the emerging resistance of bacterial pathogens to antibacterial drugs; and, 3) the elimination of undesirable residues from contaminating animal products destined for human consumption. Results from these studies may lead to development of new strategies to control mastitis and provide a viable alternative to less effective mastitis control procedures based on traditional chemotherapy.

References