# New UP project to support South African dairy industry

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Mastitis is one of the most common diseases affecting dairy cattle, causing huge annual financial losses to the dairy industry. Antibiotics are usually administered to treat this infectious and occasionally fatal disease of the mammary glands. Treatment results can vary greatly within and among farms, and treatment failure is sometimes blamed on antimicrobial resistance (AMR). AMR occurs when strains of bacteria become resistant to antibiotic medicines, rendering them ineffective in treating or preventing infections. A new project by researchers at the Faculty of Veterinary Science at the University of Pretoria (UP), funded by Milk SA, the statutory body of the milk industry, tackles some of the big unanswered questions regarding treatment failure at South African dairies. Led by Dr Martin van der Leek, from the Department of Production Animal Studies, the project on 'Resistance to available antibiotics in lactating cows with mastitis' looks at treatment failure caused by AMR and mastitis caused by other factors.

There are strict regulations in place to which milk producers and processors must adhere to ensure the safety and wholesomeness of milk as a food product. Milk is tested routinely and any batch found to have antibiotic residues is discarded, as will milk that shows excessive presence of cells indicative of mammary gland infections. Therefore, to avoid financial losses, it is imperative that dairies ensure a healthy herd and milk of a high quality. This task is complicated by many factors related to management, cattle, environment and infectious agents.

There are many causes of treatment failure and, given its global importance, it is important to establish the extent of AMR as the cause and to establish and elucidate the other factors that add to the complexity or this issue. The study ultimately aims to establish the extent of AMR in the bacteria that cause mastitis, to identify and propose the conditions for appropriate antibiotic use and to highlight all the other factors that can be managed to decrease mastitis. AMR in bacteria that affect dairy cattle and other animal species can translate to human bacterial infections, making treatment ineffective. Recently, and for the first time, scientists have found a common species of bacteria, *Escherichia coli*, that carries a gene for resistance to colistin, one of the last-resort antibiotics.

Dr Van der Leek and his research team are investigating all the possible causes of mastitis treatment failure and working to determine whether and to what extent AMR plays a role. AMR is a hot topic around the world and is leading to an overall reduction in antibiotic use in farm animals. Dr Van der Leek explains that AMR has existed for a long time, but the overuse of antibiotic medications preferentially kills sensitive bacteria, allowing resistant bacteria to become more prominent as they survive to transfer their resistance to subsequent generations.

Mastitis is caused by a variety of bacteria, both infectious and environmental, that can infect the udders of cows. Environmental bacteria thrive in specific environments where cows live, whereas infectious bacteria spread among cows. It is important to determine the specific cause of a case of mastitis, to select the appropriate antibiotic (if indicated), to follow the correct treatment procedure and to discard the abnormal and antibiotic-containing milk. Appropriate therapy reduces antibiotic usage and improves treatment success.

Components of the project are cross-departmental within the Faculty, and some are being done in collaboration with other universities, both local and international. These components include an online and on-farm survey to identify all the factors involved in the treatment and prevention of mastitis on South African dairy farms. Areas of interest include management, employees, nutrition, housing and all activities related to the milking parlour. The research will look at both perceptions and practices. Any deficiencies common to the industry will be identified so they may be remedied through the sharing of results and possibly through education programmes. Another component involves examining the economics of mastitis treatment and control in collaboration with Dutch counterparts. The researchers are also looking at somatic cell count (SCC) variation in dairy cows, by season and region. Somatic cells are the white blood cells produced by the cow's immune system to fight mastitis, the levels of which increase during an infection. Infections of the udder are not always visible in the milk, but can be detected by an increase in the SCC. If the SCC is too high, the milk is of poorer quality milk and has a shorter shelf life, leading to a loss in milk production. The Faculty's Milk Lab routinely tests for AMR in bacteria isolated from milk samples that look normal but have a high SCC. The team at the Milk Lab have created an extensive database and have published their findings in this regard. They have now begun testing abnormal milk samples. There are commercial labs that offer testing of milk samples but their data has never been compiled to review historical trends. The team plans to continue monitoring this data.

Through the combination of all its research components, the project aims to distinguish between perceived AMR due to inappropriate and incorrect mastitis treatment and prevention, and true AMR. Based on its findings, the project also aspires to identify on-farm opportunities for intervention. As the data develops, so too will the project's focus areas. This producer-orientated research is sure to contribute positively to the management of dairy farms across South Africa. Although the relative global contribution of the dairy industry to the development of AMR is small, it is a proactive industry committed to doing its part.

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