



This research may lead to a novel and alternative way to help farmers protect their animals against disease and keep the meat antibiotic free, and may also lead to improved disease control in humans.

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## Improving Resistance and Resilience: The Role of Galectins in Periparturient Ruminants

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### Who cares and why?

Animal products contribute more than \$43 billion annually to U.S. agriculture, and the demand for animal products is increasing. Animal diseases cost the industry \$2.8 billion each year; however, current disease treatment focuses on the use of antibiotics, rather than exploring ways for the body to mount its own defense against disease. Concerns about food safety, drug residues in products sold to the general public and the rise in antibiotic resistance are increasing, prompting researchers and the public to become interested in alternatives to antibiotic treatments.

Galectins are a class of proteins that may hold the key to the body's ability to mount its own defense against diseases. N.C. A&T researchers have evaluated the galectins in the blood of cattle, sheep and goats that are within 21 days before or after giving birth, when resistance to infection is typically low. Researchers hope to identify genetic markers and management approaches that will aid in the control of diseases. From their evaluations, they have concluded that galectins play an important role in immunity. This is the first research to identify and observe the role of galectins in cow, sheep and goats' blood.

This research may lead to a protocol for breeding naturally resilient, resistant livestock, thereby helping to solve the problem of antibiotic overuse. and to novel strategies for controlling disease in cattle, sheep and goats by producing better diagnostics, preventive measures and targeted treatments, which may have similar implications for humans as well. The body, using galectins, could be prompted to heal itself, even in cases where other strategies to use an animal's innate immune system have failed.

### What has the project done so far?

Using pregnant and nonpregnant St. Croix sheep, Boer X goats and Holstein-Friesian cows, the researchers collected and analyzed selected animals' body weight, body condition, fecal and blood samples 21 days before and after giving birth. Twelve galectins were categorized by how they expressed, or converted DNA "information" into a functional product in the presence of, and by how they modulated, or changed their response to, different types of parasitic infection. The molecular patterns associated with certain pathogens were also examined. Researchers found a distinct pattern of galectin expression during the periparturient period, 21 days before and after giving birth, indicating that galectins were active at this time.



## Impact Statement

N.C. A&T researchers are contributing important new information about cattle, sheep and goats' the immune response to pathogens so that effective, non-antibiotic treatments can be developed to reduce disease. An effective, natural method of disease control can save the industry billions of dollars in lost animals and expensive treatments, and will contribute greatly to sustainable animal production, global food security and safety. This research could also help overcome the threat of antibiotic resistance, giving it important implications for public health as well.

### What research is needed?

Efforts are underway to identify the functions and workings of individual galectins to better understand the way they work in fighting disease, and to determine whether they may be able to change the animals' immune response. Identifying and using galectin inhibitors as anti-inflammatory agents can be integrated into novel technologies to combat infectious diseases.

### Want to know more?

Dr. Mulumebet Worku, (336) 430-8026, [worku@ncat.edu](mailto:worku@ncat.edu)

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