NEW HORIZONS IN IMMUNOLOGY

News on research advances in cattle immune science
sponsored by Bayer HealthCare Animal Health

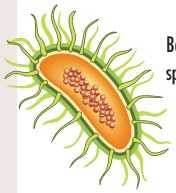
Cancer researchers in the early 1990s were attempting to piggyback the DNA of bacteria onto complex steroid molecules, trying to directly insert false genetic coding into cancer cells and trick the body's own immune system into destroying the cells. The researchers made a surprising discovery. Regardless of what type of DNA they used, test subjects mounted a strong immune response. Something about the carrier itself caused the body to set off physiological alarms and set the immune system in motion.

It would be another decade before a trio of American and French molecular biologists discovered the mechanism responsible—winning a Nobel Prize in medicine along the way. We now understand those test subjects' immune systems were reacting to molecular patterns not found in the cells of mammals but frequently found in bacteria, viruses and fungi. These molecular patterns are known as Pathogen Associated Molecular Patterns (PAMP). For example, the DNA of bacteria or viruses attach to specific receptors of white blood cells, setting off near-instantaneous actions that engulf and kill infectious microbes and signal other, more-specialized immune cells to join in.

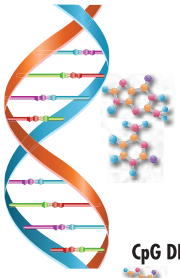
Those scientific advances have opened up new horizons in combatting old and frustrating diseases by taking advantage of the body's "innate" immune system—the front line response that mounts a general defense rather than a specific one. Most cattle producers and veterinarians are familiar with the "adaptive" immune system that uses specific vaccines to prevent specific disease. But the science of innate immunity is still new, says Larry Hawkins, technical services veterinarian for Bayer Healthcare Animal Health. "When I was in vet school, it was all about the adaptive system," Hawkins says. "The innate immune system was an afterthought."

That change in thinking about immune response has created a bonanza of research in the past two decades on the possibilities of using the innate immune system to fight diseases like cancer and flu in humans and the bane of U.S. cattle production, Bovine Respiratory Disease Complex.

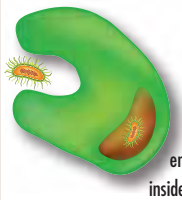
HOW IT WORKS



Bacteria and viruses contain specific repeating patterns of molecules in DNA that stimulate the immune cells.



When harmful bacteria and viruses enter the body, those patterns are recognized as danger signals by structures known as surveillance receptors that are used by the innate immune system's first responders. Like a lock in a key, the patterns fit only within a specific surveillance receptor.



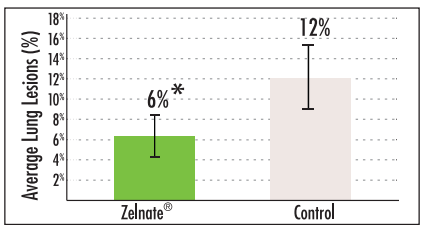
Once the first responders, or immune cells, are activated by the danger signal, they engulf the invading microbe, wall it off inside their cell, digest it, and then activate the adaptive immune system's specific response. The adaptive system has been traditionally targeted by cattle vaccines. This new-generation immunostimulant improves that innate immune process by attracting other white blood cells to fight the infection.

BRD REMAINS AN ONGOING BATTLE

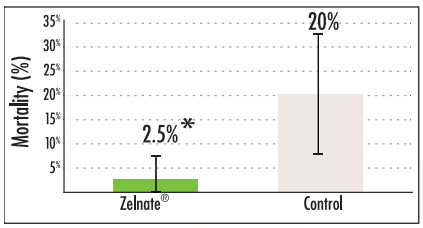
Even though there are several effective antibiotics and vaccines to help combat Bovine Respiratory Disease, BRD remains an ongoing battle, which costs the industry $1 billion annually. "We need to try something different," says feedlot veterinary consultant Stan Perry, of Emporia, Kan.

Next-generation immunostimulants that bolster the calf's innate immune system offer the next step. In one study, 4-month-old steers given an immunostimulant by IM injection and then infected with *M. haemolytica* at the same time showed significantly less severe lung damage. In another, similar calves given the immunostimulant 24 hours after challenge showed significantly less death loss.

IS ZELNATE EFFECTIVE?



Average lung lesion scores five days after challenge between calves receiving either Zelnate® or a negative control at the same time as intratracheal *M. haemolytica* challenge.



Cumulative mortality at five days after challenge between calves receiving either Zelnate® or a negative control 24 hours after intratracheal *M. haemolytica* challenge.

The first immunostimulant shown to aid in the treatment of bovine respiratory disease due to *Mannheimia haemolytica*, Zelnate® jumpstarts the calf's own defense system to help fight BRD. Visit Zelnate.com to learn more.

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