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Researchers Exploit Cattle Pathogen's Genomic Secrets

With genomic 'maps' in hand, Agricultural Research Service (ARS) scientists are plotting new ways to protect cattle from cellular attack by *Anaplasmosis marginale*.

A. marginale is a primarily tick-borne bacterium that invades and destroys the red blood cells of cattle and other ruminant hosts. Severe infections cause anemia, weight loss and death. Between 50,000 and 100,000 U.S. cattle succumb to it annually. Those surviving the disease-known as anaplasmosis-become lifelong carriers that can endanger other herd members and impede U.S. cattle trade.

Although antibiotics can kill *A. marginale*, a long-sought alternative strategy has been to develop a vaccine to keep the bacterium from infecting cattle in the first place. However, vaccination has been dogged by safety issues and uneven performance. A chief reason is *A. marginale*'s ability to reconfigure its surface proteins and evade detection by the animals' immune systems, according to Lowell S. Kappmeyer, a geneticist in the ARS Animal Diseases Research Unit (ADRU) at Pullman, Wash.

Now the jig could be up, thanks to Kappmeyer and colleagues' success in determining the nucleic acid sequence for the genome of the bacterium's St. Maries strain, which is tick-transmitted. His fellow 'decoders' include ADRU research leader Don Knowles, other scientists in the unit and a team led by Guy Palmer at Washington State University-Pullman.

The advance, first reported in January 2005, has enabled the researchers to identify 70 percent of *A. marginale*'s genes, including those encoding for two protein superfamilies. Many superfamily proteins reside on the bacterium's outer surface, where the host's immune system searches for them in order to mount a defensive response.

According to Lowell, the discovery raises the prospect of devising new vaccines that will help the immune systems of cattle to better recognize the bacterium's protein-shuffling shenanigans and to flag them with antibodies that mobilize pathogen-eating cells.

Genomics research in sheep holds great potential for many production, health and management areas. It is also one of the priority initiatives identified by the Tri-Lamb group. The American Sheep Industry Association's Board of Directors voted unanimously during its annual meeting to incorporate a new policy for the industry that encourages increased funding from the U.S. Department of Agriculture to support international sheep genomics research and education efforts.

You can read more about this research at www.ars.usda.gov/is/AR/archive/feb07/disease0207.htm.
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