Research findings suggest nilgai antelope are not carriers of bovine babesiosis

August 8 2024, by Sarah Fuller

Texas A&M AgriLife research findings indicate non-native nilgai antelope do not appear to be susceptible to infection following exposure to Babesia bovis, one of two species of parasitic protozoa responsible for the disease known as cattle fever or bovine babesiosis. Credit: Sam Craft/Texas A&M AgriLife

Nilgai, a non-native antelope species that freely ranges Southern Texas

and Northeastern Mexico, do not appear to be susceptible to infection following experimental exposure to Babesia bovis, according to recent findings by Texas A&M AgriLife Research scientists.

The Babesia bovis strain is one of two species of parasitic protozoa responsible for the disease known as cattle fever or bovine babesiosis.

The research, published in *Parasites & Vectors*, significantly contributes to nationwide efforts to better understand the role of wildlife in the epidemiology of bovine babesiosis. Nilgai are a particular wildlife species of concern because of their capacity to spread ticks over a large range.

Bovine babesiosis is a virulent tick-borne disease, with up to a 90% mortality rate in cattle without prior exposure to the parasite. It plagued the U.S. cattle industry in the 19th and early 20th centuries and remains a serious concern for the industry.

Tammi Johnson, Ph.D., AgriLife Research assistant professor of disease ecology in the Texas A&M College of Agriculture and Life Sciences Department of Rangeland, Wildlife and Fisheries Management, Uvalde, led the study.

"These leading-edge discoveries illustrate AgriLife Research's ongoing commitment to the health and sustainability of our agricultural and natural resources," said G. Cliff Lamb, director of AgriLife Research. "Texas is the nationwide leader in beef cattle production, and our experts work on the frontlines to ensure the security and economic strength of this critical food system."

Ticks as a vector for the disease

In North America, two tick species, Rhipicephalus annulatus and

Rhipicephalus microplus, transmit the parasitic protozoa that attack red blood cells causing anemia and fever, Johnson said. These species are commonly referred to as cattle fever ticks.

Thanks to the Cattle Fever Tick Eradication Program—a cooperative effort between the USDA's Animal and Plant Health Inspection Service, APHIS, and state animal health agencies—bovine babesiosis was eradicated from the U.S. in 1943. However, the disease remains endemic to Mexico, and infestations of cattle fever ticks are still documented along the Texas–Mexico border.

In Texas, the federal Cattle Fever Tick Eradication Program is responsible for monitoring the Permanent Fever Tick Quarantine Zone that spans 580,000 acres from Brownsville to Del Rio, while the Texas Animal Health Commission, TAHC, monitors all areas outside of the permanent quarantine zone. Together, these two entities surveil more than 1 million acres of Texas rangelands. Despite strict monitoring efforts by both organizations, infestations of cattle fever ticks are regularly found outside of the quarantine zone.

The latest Monthly Fever Tick Situation Report available from the TAHC reports six Texas counties with quarantined infestations in May.

Wildlife as a complicating factor in tick control

Although cattle fever ticks' primary host animal is domestic cattle, they will feed on other hooved animals known as ungulates.

"Wildlife movement is one challenge we face in preventing the spread of cattle fever ticks," said John Picanso, director of APHIS' Veterinary Services Cattle Fever Tick Eradication Program, Austin.

Treatment options do exist to reduce the number of cattle fever ticks on

wildlife, but detecting the arachnids on the more than 460,000 estimated free-ranging white-tailed deer and nilgai throughout South Texas is difficult.

While previous research ruled out white-tailed deer as carriers of bovine babesiosis, the role of nilgai in transmitting the disease was unknown prior to the new study.

"Nilgai are the most abundant free-ranging exotic species in Texas," Johnson said. "They have an incredibly large home range, and a lot of the cattle fever tick outbreaks we see may be a result of wildlife movement."

Johnson said both nilgai and the tick R. microplus are native to India, a continent that also struggles with bovine babesiosis. Additionally, nilgai are in the same scientific family as domestic cattle, making them a distant relative.

"We have all these related factors that exist in India now coexisting in the U.S.—I realized that we had to do something to better understand nilgai's potential role in harboring or spreading this disease," Johnson said.

Study yields surprising yet promising results

Researchers inoculated two groups of nilgai with different life stages of B. bovis, one strain of parasitic protozoa responsible for bovine babesiosis. In a parallel study, beef cattle were also inoculated, and both groups were monitored through an array of blood tests over the study period.

No clinical signs of infection in either nilgai group were documented following inoculation. Further, blood samples from all nilgai were

polymerase chain reaction, PCR, negative for the bovine babesiosis parasite, and the animals did not develop antibodies to the B. bovis strain.

"It appears from our research that the parasites are not able to infect the red blood cells of the nilgai," Johnson said. "If they can't infect the red blood cells, they can't reproduce and move to the next life stage to be picked up by a female tick and transmitted to another animal."

Additionally, nilgai tissue samples showed no signs of infection, and analysis of red blood cell cultures indicated no signs of colonization by the protozoan.

To test these results even further, Johnson said, researchers subinoculated cattle with blood from the challenged nilgai in the study. These cattle showed no signs of clinical infection and were PCR-negative for the bovine babesiosis parasite up to 45 days later.

"I was surprised—I thought we would see some evidence of infection," Johnson said. "We threw the gamut of diagnostic tests at this project and found zero evidence of infection in the nilgai."

Management implications and next steps for research

While these findings do provide a sense of relief, Johnson said it doesn't change the fact that nilgai and white-tailed deer still move ticks with the potential to carry bovine babesiosis throughout their range.

"What we now know is nilgai will not move infected ticks around the landscape, which is good news," Johnson said. "But I think the main takeaway is that we still have to address the problem of these ticks being present, and we currently don't have an approved treatment protocol for nilgai."

Currently, Johnson and collaborating researchers are working to replicate this study using the second cattle tick species, R. annulatus, and a different species of Babesia, B. bigemina, that also causes bovine babesiosis.

"This second study will allow us to have the full picture of how nilgai respond to different species that cause bovine babesiosis," Johnson said.

Picanso, with APHIS' eradication program, said Johnson's research is an invaluable scientific resource that augments current knowledge and will guide future management actions to control cattle fever ticks.

Economic impact and ongoing Texas A&M AgriLife contributions

Johnson is one of many researchers across the country working to address the threat of bovine babesiosis and its potential agricultural impacts.

David Anderson, Ph.D., professor and Texas A&M AgriLife Extension Service economist in the Department of Agricultural Economics serves alongside Johnson on the USDA Grand Challenge group on cattle fever ticks.

A 2010 Agriculture and Food Policy Center report led by Anderson assessed the economic impact of an expansion in cattle fever ticks outside of their current range.

Their analysis estimates the cost of a relatively small cattle fever tick outbreak outside of Texas' quarantine zone would total $123 million in the first year. If this outbreak were to expand to the historic range cattle fever ticks once occupied across Texas and the Southeastern U.S., the

minimum cost would be $1.2 billion in the first year alone.

"Texas A&M has been involved in cattle tick research from the early stages of the effort," Anderson said. "I anticipate we will continue to be an integral part of this extremely important work into the future."

More information: Tammi L. Johnson et al, Nilgai antelope display no signs of infection upon experimental challenge with a virulent Babesia bovis strain, *Parasites & Vectors* (2024). DOI: 10.1186/s13071-024-06316-3

Provided by Texas A&M University