New hoof disease treatments investigated

For almost 40 years, digital dermatitis — also called heel warts — has plagued cattle throughout the world, causing painful hoof lesions that limit the amount of time cows can stand and feed, thus hindering animal welfare and food production. The disease can be found on almost every beef and dairy farm in North America, so it has a significant economic impact on those industries in the U.S. Researchers at the University of Wisconsin-Madison School of Veterinary Medicine are helping to find new ways to address the disease. Some of this work has led to the development of more effective treatments. However, the road to these innovative approaches began with research that can have an effective testing method.

For digital dermatitis, we developed an experimental infection model to reproduce and treat acute digital dermatitis lesions in cattle in a standardized way and in a controlled environment,” Dorte Dopfer, graduate student in Wisconsin’s Madison assistant professor of food animal medicine and an expert in veterinary epidemiology, said. This involved isolating a very small population of cattle in a laboratory setting free from other factors that can affect the natural course of the disease. According to Dopfer, the experimental model helps improve animal welfare. Many treatment and preventive measures hit the market before being properly tested, which can be detrimental to millions of cattle. The infection model allows her research team to prescreen products on a small-scale population before they are used in the field.

“In addition, the impact on the test cows is minimal,” Dopfer said. As part of any study, the induced acute lesions are treated with antibiotics immediately. The pain is gone within a day, and the lesions do not become chronic. The cattle lead a perfectly healthy life afterwards.

The experimental model has been used successfully in university-industry partnerships aimed at developing better ways to prevent and treat hoof diseases. Zinpro Corp. has been collaborating with Dopfer on clinical trials since 2010. By analyzing data from those trials, she and Arturo Gomez Rivas, a research assistant at the School of Veterinary Medicine, helped assess the effectiveness of treatments that prevent digital dermatitis in pre-calving heifers.

“Dopfer and her colleagues have identified treponemes as a primary culprit in 2011, said. Field tests have shown that the botanical hoof bath also helps prevent chronic lesions, which is vitally important for controlling the disease. While acute active lesions can cause pain and lameness, they can still reside deep in the skin,” Dopfer said. “This can cause serious problems for the animal owner, which have thick skin and spread rapidly. They act as reservoirs of infection, and they are precious to new, acute lesions.” Eventually, Dopfer hopes to see widespread adoption of an integrated prevention and control system — including dietary factors — and recorded records — for digital dermatitis.

Supplementation One observation made in my long-term study was that performance varied dramatically from year to year. Average daily gain (ADG) was 1.22 lb. per day, the range was from 0.77 lb. to 1.80 lb. per day. Clearly, in some years, heifers would need significant supplementation to reach a desired breeding weight, while in other years, development would be adequate without supplementation.

Higher performance was related to higher crude protein and total digestible nutrient levels in forage at the start of the grazing season. Blood urea nitrogen levels and body condition through the winter on pastures with higher protein (and blood urea nitrogen) was high at 17.7%, and the ADG response of the heifers was what one would expect for an energy supplement — 1.01 lb. versus 1.23 lb. per day. In the second year, crude protein was lower at 12.8%, and ADG improved from 0.51 lb. to 1.01 lb. per day as a result of supplementation.

Others have noted that heifers might respond to protein supplementation in some situations but not in others, primarily based on the crude protein content of the forage (Poore and Drewnoski, 2010). A two-year study (Poore et al., 2012) was recently completed that evaluated supplementing heifers (initially 597 lb. with a body condition score of 5.2) with 0%, 0.5%, 1.0% or 1.5% of bodyweight of a 50/50 mix of soybean hulls and corn gluten feed. Heifers were grazed on pastures for 56 days before being synchronized and bred by artificial insemination, followed by a cleanup bull. Key results are shown in the Table.

Heifers supplemented at increased levels showed a linear increase in ADG and body condition score. Breeding rate following artificial insemination increased linearly, with a tendency for a quadratic effect. Likewise, there was a linear and quadratic increase in the overall breeding rate, with a substantial increase from the first level of supplementation and no increase thereafter.

Increasing the supplementation level dramatically increased gain per acre, but there was little change in forage intake until the highest level of supplementation. Heifer days per acre showed a much lower response.

Based on these results, it appears that developing heifers with a low level of supplement would economically improve reproductive performance, while the higher levels might be more appropriate for stocker heifers destined for finishing.

My current work is focusing on low-level supplementation and increasing forage allowance as strategies to optimize reproductive performance.

Treatment for digital dermatitis adds a new dimension to the understanding of the importance of the bacteria play in the process,” Gomez Rivas, who identified treponemes as a primary culprit in 2011, said.

Supplementation with Zinpro’s product, which contains botanical hoof bath, also helps prevent the bacteria from spreading. Field tests have shown that the botanical hoof bath also helps prevent chronic lesions, which can be treated with topical antibiotics.

“Even after topical treatment of these active lesions, treponemes still reside deep in the skin,” Dopfer said. “The bacterial cells can cause serious problems for the animal owner, which have thick skin and spread rapidly. They act as reservoirs of infection, and they are precursors to new, acute lesions.” Eventually, Dopfer hopes to see widespread adoption of an integrated prevention and control system — including dietary factors — and recorded records — for digital dermatitis.