

# DAIRY VETERINARY NEWSLETTER

January 2024

## 100<sup>th</sup> Issue of the Dairy Veterinary Newsletter

Since I had the honor of inheriting this newsletter from Dr. Clell Bagley in late 2006, this is my 100<sup>th</sup> issue. The first few are no longer available electronically, and neither are most of the dairy veterinary newsletters written by Dr. Bagley before that. The first time I saw one of Clell's newsletters was approximately 30 years ago; another newsletter incorporated it. I always looked out for things written by Clell afterward. He may have written something close to 200 issues during his 32 years at Utah State. Thanks to all of our readers and those whose own scientific papers and other communications have led to features in the newsletter over the last 17 and a half years. In addition, it has been great to communicate the findings of some of our own applied research here at USU. I look forward to continued collaboration and communication with you going forward. We are just getting started with our new College of Veterinary Medicine four year program.

Previous newsletters can be accessed at: <https://extension.usu.edu/dairy/>

## CRISPR Gene Editing is Increasingly Adopted - Including Application in the Dairy Industry

Not long ago, I shared the skepticism that hundreds of medical and genetics experts did when they signed a joint letter regarding the bioethics of gene editing, making their concerns clear. This is still an extremely important subject, and gene editing in humans or non-human species requires strong ethical oversight, including regarding food safety from products derived from modified animals. However, the use of CRISPR/Cas9 (clustered regularly interspaced short palindromic repeats) to edit DNA in single cells, whether embryos or other cell types, to modify traits of dairy cattle as well as other species is rapidly gaining acceptance. An article by T. Sonstegard in Progressive Dairy, November 2023 provides a good summary of these new developments. The entire article can be found online here:

<https://www.agproud.com/articles/58538-gene-editing-how-it-works-and-what-it-could-do-for-the-dairy-industry>

The article makes the point that, "Traditionally, combating cattle diseases has relied on measures such as biosecurity and vaccination, which are strategies not available to dairy producers on a global basis. - - Challenges - - are further exacerbated by climate change, especially when heat-mediated stress leads to increased susceptibility to infectious disease." While the article discusses challenges worldwide, including in less developed countries, it also refers to issues close to home. In Utah, we are experiencing more extreme weather, including flooding as well as prolonged drought/chronic water shortage. Heat stress is an ever important problem during the summer, and traditional cow cooling strategies face difficulty and expense in providing water. How can gene editing help the dairy industry across the U.S. and the world provide food with even greater efficiency?

“The first step is to identify which trait is being ‘crossed’ into an animal’s genome. The traits of interest are most likely those determined by breed associations, leading breeders or breeding companies that are or will be in demand in the genetics marketplace.” (This concerns me somewhat. Ideally, independent research would help identify needed characteristics, including that done at agricultural universities. Later in the article, the author does refer to such university research, however.)

Sonstegard continues, “Currently, the most transformative breeding tools are based on the Nobel-prize [winning] CRISPR/Cas9 enzyme complex. Interestingly, CRISPR/Cas was discovered as a defense system in bacteria against the invading DNA of bacterial pests. This defense system was transformed in the laboratory to be a tool providing precise DNA cuts - - for any species with [a] known genome sequence. Functioning like molecular scissors, this [ribonucleotide protein complex] induces cuts that are followed by prompt DNA self-repair of the treated cell or embryo. The cow has a reference genome sequence, so this allows us to design tools that can cut most anywhere in the bovine genome.”

### **The first characteristics modified by CRISPR in beef or dairy cattle**

The earliest CRISPR modified bovine animals:

- Increased muscle mass compared to “conventionally bred” Zebu, 2013
- Polled dairy cattle from “horned [single] cells”, 2015
- Heat tolerant Angus (Brazil), 2018, first CRISPR genetic modification commercially allowed in U.S. and Brazil by regulations, 2020
- Heat tolerant Holsteins, shortened prolactin receptor (PRLR), causing *SLICK* gene resulting in a short and sleek hair coat (introduced by crossbreeding with naturally mutated sires for AI in U.S., 2020.)

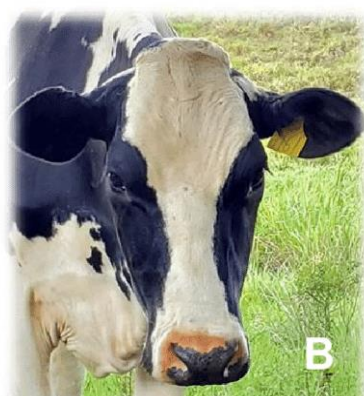
SLICK genetically modified Holsteins incorporate a natural mutation that arose in Puerto Rico and other areas of the Caribbean Basin, but now it can be created using CRISPR. The US Food and Drug Administration (FDA) still approves commercial application of CRISPR modified animals on a case by case basis, investigating food safety for meat, milk, or other products produced. The “slick” hair coat phenotype is shown in Figures 1 - 3 below:



Fig. 1 - SLICK gene Holstein, University of Florida, Larson



Fig. 2 - “Wild type” Holstein (A) Research Gate, Ortiz-Colon



SLICK Holstein – note short poll hair (B)



Fig. 3 - SLICK calves are sometimes grayer than “wild type” Holsteins, New Scientist

Evidence shows cattle health and milk production advantages of the “slick” hair coat in warm temperatures, and no problems with meat or milk safety according to the FDA “Risk Assessment Summary – V-006378 PRLR-SLICK cattle”. As is often the case with FDA documents, this one incorporates at least one element of mystery - I can find no date of when it was released. Nevertheless, it states, “FDA did not identify any human food safety concerns associated with - - PRLR-SLICK cattle. In addition, there is a history of safe human consumption of food products derived from conventionally raised cattle with slick phenotypes.”

CRISPR modifications and approval of food from such animals in the dairy, beef and other food animal industries are almost certain to be increasingly adopted in the near future, and will benefit food production worldwide. Dairy veterinarians, breeding and genetics experts, and allied industry will be involved in research, ethical oversight, and recommendations regarding the practical breeding of such animals.

### Utah State Dairy Extension Workshops in February 2024

There will be a Dairy Extension Workshop on Tuesday Feb. 27, 2024 in Cache Valley and the same program will be presented on Wednesday Feb. 28 in Delta, UT:

#### 2024 Dairy Extension Workshops

**February 27 - Cache County USU Caine Dairy Classrooms - 4300 US Hwy 89, Wellsville, UT, 10 am to 3 pm**

**February 28 - Millard County USU Extension Millard County Office - 83 Manzanita Ave, Delta, UT, 10 am to 3 pm**

#### 10:00 to 10:05 am Welcome and Introductions

Justin Clawson, USU Extension Cache County

Kalen Taylor, USU Extension Millard County

#### 10:05 to 10:55 am Risk Management

Ryan Larsen, USU Agribusiness Extension Specialist

#### 10:55 to 11:30 am Ag Water Optimization

Hannah Freeze, UDAF

#### 11:30 to 12:00 pm Does Utah got milk? - Dairy Benchmarks/Dairy Challenge Report

Bruce Richards, USU Dairy Extension Specialist

#### 12:00 to 1:00 pm Lunch sponsored by IFA

#### 1:00 to 1:30 pm Preserving Dairy History

Justin Clawson, USU Extension Cache County

#### 1:30 to 2:00 pm Creating a Welcoming Work Environment

Bruce Richards, USU Dairy Extension Specialist

#### 2:00 to 2:50 pm Selective Dry Cow Therapy

Mireille Chahine, UI Extension Dairy Specialist

#### 2:50 to 3:00 pm Survey of Attendees

5600 Old Main Hill  
Logan UT 84322-5600

We hope you can attend one of the workshops described above. Some of you have been with Clell and I on our journeys that include this newsletter for many years, as well as numerous other great interactions. There are also many colleagues who are former students among our readers, which is great to see. I saw Clell recently and he is doing very well and still has encyclopedic knowledge about many aspects of livestock health. Please let us know your comments and suggestions for future topics. I can be reached at (435) 760-3731 (Cell), or [David.Wilson@usu.edu](mailto:David.Wilson@usu.edu).

David Wilson, DVM, Dairy Extension Veterinarian

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