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Decoding the Longhorn Genome

By: [Daniel Oppenheimer](#) | Posted: Monday, March 25th, 2013 |

AUSTIN, Texas — Texas Longhorn cattle have a hybrid global ancestry, according to a study by University of Texas at Austin researchers published this week in the Proceedings of the National Academy of Sciences.

The study of the genome of the Longhorn and related breeds tells a fascinating global history of human and cattle migration. It traces back through Christopher Columbus' second voyage to the New

World, the Moorish invasion of Spain and the ancient domestication of the aurochs in the Middle East and India.

"It's a real Texas story, an American story," said [Emily Jane McTavish](#), a doctoral student in the lab of biology professor [David Hillis](#). "For a long time people thought these New World cattle were domesticated from a pure European lineage. But it turns out they have a more complex, more hybrid, more global ancestry, and there's evidence that this genetic diversity is partially responsible for their greater resilience to harsh climatic conditions."

To reconstruct the genetic history of Texas Longhorns, McTavish, Hillis and colleagues from the University of Missouri-Columbia analyzed almost 50,000 genetic markers from 58 cattle breeds. The most comprehensive such analysis to date, it was funded in part by the Cattlemen's Texas Longhorn Conservancy, which helped the scientists get access to samples used by ranchers.

Among the findings was that the Texas Longhorn breed are direct descendants of the first cattle in the New World. The ancestral cattle were brought over by Columbus in 1493 to the island of Hispaniola. They traveled the rest of the way to the continent in 1521 on the ships of later Spanish colonists.

Over the next two centuries the Spanish moved the cattle north, arriving in the area that would become Texas near the end of the 17th century. The cattle escaped or were turned loose on the open range, where they remained mostly wild for the next two centuries

“It was known on some level that Longhorns are descendants from cattle brought over by early Spanish settlers,” said Hillis, the Alfred W. Roark Centennial Professor in the College of Natural Sciences, “but they look so different from the cattle you see in Spain and Portugal today. So there was speculation that there had been interbreeding with later imports from Europe. But their genetic signature is completely consistent with being direct descendants of the cattle Columbus brought over.”

The study reveals that being a “pure” descendant of cattle from the Iberian peninsula indicates a more complicated ancestry than was understood. Approximately 85 percent of the Longhorn genome is “taurine,” descended from the ancient domestication of the wild aurochs that occurred in the Middle East 8,000-10,000 years ago. As a result, Longhorns look similar to purer taurine breeds such as Holstein, Hereford and Angus, which came to Europe from the Middle East.

The other 15 percent of the genome is “indicine,” from the other ancient domestication of the aurochs, in India. These indicine cattle, which often have a characteristic hump at the back of the neck, spread into Africa and from there up to the Iberian peninsula

“It’s consistent with the Moorish invasions from the 8th to the 13th centuries,” said Hillis. “The Moors brought cattle with them, and brought these African genes, and of course the European cattle were there as well. All those influences come together in the cattle of the Iberian peninsula, which were used to stock the Canary Islands, which is where Columbus stopped and picked up cattle on his second voyage and brought them to the New World.”



Emily Jane McTavish, a doctoral student in the lab

Once in the New World, most of the cattle eventually went feral. Under the pressures of natural selection they were able to re-evolve ancient survival traits that had been artificially bred out of their European ancestors. Selection for longer horns allowed them to defend against wild predators. They became leaner and more able to survive heat and drought.

“The Longhorns that were in

of biology professor David Hillis, is shown here, with Longhorns, at Hillis's Double Helix Ranch. Photo by Liz Milano.

the area when Anglo settlers arrived almost looked more like the ancestral aurochs

than like modern cattle breeds,” said McTavish. “Living wild on the range, they had to become very self sufficient. Having that genetic reservoir from those wild ancestors made it possible for a lot of those traits to be selected for once again.”

McTavish said it’s possible the indicine heritage in particular helped, because the climate in India and Africa tended to be hotter and drier than in Europe.

The Longhorns remained wild on the range, or very loosely managed, until after the Civil War, **when Texans rounded up the wild herds** and began supplying beef to the rest of the country. Since then the fortunes of the Longhorns have waxed and waned depending on how their unique genetic profile intersects with the changing needs of American consumers.

“The Longhorns almost went extinct starting in the late 19th century,” said Hillis. “A lot of the value of cattle at that time had to do with the fat they had, because the primary lighting source people had was candles, made of tallow, and Texas Longhorns have very low fat content. Ranchers began fencing off the range and importing breeds from Europe that had higher fat content. That’s when Americans began developing their taste for fatty beef, so then the other cattle became valuable in that respect as well. The only reason the Longhorns didn’t go extinct was because half a dozen or so ranchers kept herds going even though they knew that these other breeds were more valuable in some sense. They appreciated that the Longhorns were hardier, more self-sufficient.”

Hillis, who raises Longhorns of his own out at the **Double Helix Ranch**, said that the winds of history now seem to be blowing in the Longhorns’ direction. They can survive in hotter, drier climates, which will become increasingly important as the world warms. They provide lean and grass-fed beef, which is seen as healthier by many consumers. And their genes may prove valuable to ranchers, who can use the increasingly sophisticated genetic information to selectively breed the Longhorns’ toughness into other breeds of cattle.

“It’s another chapter in the story of a breed that is part of the history of Texas,” he said.

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