Gas-Efficient Cattle

Cow gas: the culprit of greenhouse gas emissions? To an extent, but maybe not for much longer. University research finds genetics play a role in the microorganisms populating the four chambers of a ruminant's stomach.

by Lindsay King

"People started blaming agriculture, particularly cattle, as the number one contributor to climate change," says California Polytechnic State University, San Luis Obispo freshman Claire Stevenson. "Because that is inaccurate and there's been a lot of misinformation on that topic, many people have done research on how to reduce greenhouse gas (GHG) emissions from cattle."

Originally from Montana, Stevenson is a fourth-generation Angus breeder with a passion for genomics. She's studying microbiology with aspirations to find answers to the genetic questions about cattle and the microbes they harbor.

Now a student in the Golden State, Stevenson discusses agriculture with her peers at least once a week.

"I'm so fascinated by how little we actually know about genomics," she says. "They have such a large role to play in literally everything."

The human genome was the first to be sequenced and that was in 2001. The bovine genome followed, but not until 2011.

"After the genome was sequenced, we were given a map with no idea how to read it," Stevenson says. "We know what's there, we just need to figure out how to analyze it."

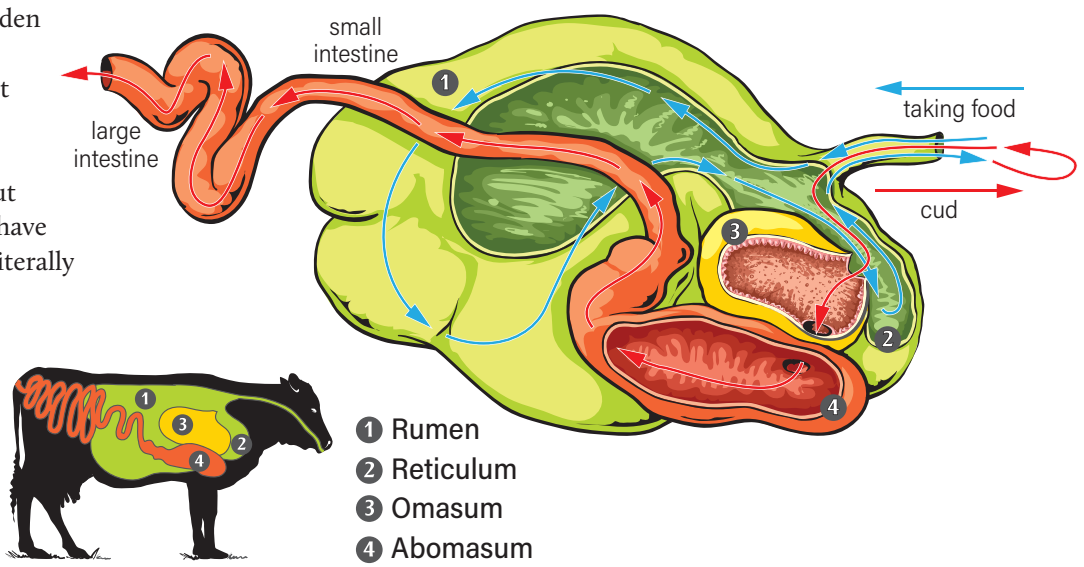
Research published by the National Geographic states genomics have a 70% influence on the resulting organism. Historically, science classes teach that genetics account for 50% of the phenotype while environment makes up the rest.

"The nature-versus-nurture concept says your environment has an equal opportunity to influence how an individual will turn out," Stevenson says. "Either way, I think it's important that we realize we literally have no idea how much genes influence our cattle; but one way or another, they do."

Feed the microbes

Without rumen microbes, cattle couldn't be the most efficient upcyclers in nature. Cellulose is inedible to humans because the body simply can't break it down. Microbes, through the process of fermentation, break the carbohydrates down into short-chain fatty acids and gas.

"The fermentation process creates up to 400 gallons of gas a day," she explains. "Thirty percent of this gas is methane and carbon dioxide."



The entire fermentation process can take up to 48 hours from start to finish. Agriculture accounts for 9% of the total GHG emissions in America; roughly a third of that is from beef production, including the production of animal feed.

"Originally it was thought the diet of an animal was what influenced cattle's emissions," Stevenson says of a study conducted by Scotland's Rural College stating otherwise. "Although the diet still affects the gas released, the genetic differences have a larger effect. It may be possible to raise less 'gassy' cattle and lower their impact on the environment."

The University of California–Davis (UC–Davis) is taking this concept one step further by using seaweed as a feed additive aimed at reducing GHGs. The project is still in the early stages, but shows promising results.

It's important to point out that breeding cattle to be more environmentally friendly than they already are will directly correlate with feed efficiency.

Today's GHG crisis

In spring 2020, genetic predictors for less "gassy" cattle are still but a pipe dream. Until Stevenson creates an expected progeny difference (EPD) to be used as a selection tool to reduce environmental impact — a feat she says would be a Nobel-Prize-sized dream — ranchers have other options for reducing their herd's GHG footprint.

"There's a lot producers can do, but the simplest one is to practice proper pasture management," Stevenson says. "Pasture management allows producers to use their grass more efficiently, and that ultimately puts more carbon back into the soil."

By segmenting pastures for harder grazing for a shorter time, cattlemen can infuse their pasture with carbon. Rotational grazing isn't exactly a novel concept, but the idea that it offsets GHG emissions — and hypothetically, climate change — might be for some.

"I understand there would be some difficulty in adding rotational grazing management practices," Stevenson says. "But by better managing our grass, we would be taking a step in the right direction." AJ

Editor's note: For more information about research being conducted at UC-Davis, visit: www.youtube.com/watch?v=DOGZVYSSFRA&vl=en.