

Why do some dogs need high chairs, and how can genetics help?

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Jake, a German shepherd dog in a Bailey chair. Dogs with megaesophagus must eat in a vertical position to help food travel to their stomachs. Credit: Beth Grant

Some dogs have to eat in a high chair—or, more specifically, a Bailey Chair. The chair keeps them in a vertical position while they eat so that

gravity can do the work their bodies can't: moving food from the mouth to the stomach.

These [dogs](#) have megaesophagus, an esophagus disorder that can prevent dogs from properly digesting food and absorbing nutrients. When you swallow a bite of food, it travels down a muscular tube, the esophagus, to the stomach. In humans, the esophagus is vertical, so our esophageal muscles don't have to fight against gravity. But because dogs are quadrupeds, a dog's esophagus is more horizontal, so "there is a greater burden on peristaltic contractions to transport the food into the stomach."

In dogs with megaesophagus, the esophagus is dilated, and those contractions are less effective. Instead of moving properly into the stomach, food can remain in the esophagus, exacerbating the problem and preventing proper digestion and nutrient absorption.

Leigh Anne Clark, Ph.D., an associate professor at Clemson University, recently spoke at Duke about megaesophagus in dogs and its genetic underpinnings. She has authored dozens of publications on dog genetics, including five cover features. Her research primarily involves "[mapping] alleles and genes that underlie disease in dogs." In complex diseases like megaesophagus, that's easier said than done. "This disease has a spectrum," Clark says, and "Spoiler: that makes it more complicated to map."

Clinical signs of megaesophagus, or mega for short, include regurgitation, coughing, loss of appetite, and weight loss. (We might use the word "symptom" to talk about human conditions, but "a symptom is something someone describes—e.g., I feel nauseous. But dogs can't talk, so we can only see 'clinical signs.'") Complications of mega can include aspiration pneumonia and, in severe cases, gastroesophageal intussusception, an [emergency situation](#) in which dogs "suck their

stomach up into their [esophagus](#)."

Sometimes megaesophagus resolves on its own with age, but when it doesn't it requires lifelong management. Mega has no cure, but management can involve vertical feeding, smaller and more frequent meals, soft foods, and sometimes medication. Even [liquid water](#) can cause problems, so some dogs with mega receive "cubed water," made by adding a "gelatinous material" to water, instead of a normal water bowl.

In dogs, mega can be either congenital, meaning present at birth, or acquired. In cases of acquired megaesophagus, the condition is "usually secondary to something else," and the root cause is often never determined. (Humans can get mega, too, but as with acquired mega in dogs, mega in humans is usually caused by a preexisting condition. The best human comparison, according to Clark, might be achalasia, a rare disorder that causes difficulty swallowing.) Clark's current research focuses on the congenital form of the disease in dogs.

Her laboratory recently published [a paper](#) investigating the genetic foundation of mega. Unlike some diseases, mega isn't caused by just one genetic mutation, so determining what genes might be at play required some genetic detective work. "You see mega across breeds," Clark says, which suggests an environmental component, but the disease is more prevalent in some breeds than others. For instance, 28% of all diagnoses are in German shepherds. That was a "red flag" indicating that genes were at least partly responsible.

Clark and her collaborators chose to limit their research study to German shepherds. Despite including a wide range of dogs in the study, they noticed that males were significantly overrepresented. Clark thinks that estrogen, a hormone more abundant in females, may have a protective effect against mega.

Clark and her team performed a [genome-wide association study](#) (GWAS) to look for alleles that are more common in dogs with mega. One allele that turned out to be a major risk factor was a variant of the MCHR2 gene, which plays a role in feeding behaviors. In breeds where mega is overrepresented, like German shepherds, "we have a situation where the predominant allele in the population is also the risk allele," says Clark.

Using the results of the study, they developed a test that can identify which version of the gene a given dog has. The test, available at veterinary testing companies, is designed "to help breeders reduce the frequency of the risk allele and to plan matings that are less likely to produce affected puppies."

Provided by Duke University

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