

Panda's Preferred Food May Be Their Kiss of Death and Could Lead to Extinction

Every day, these giant adults eat 22 pounds of a food their digestive system was never designed to consume. And GI disease is a primary cause of death — whether they're wild or captive. Can their microbiome adjust in time to save the species?

Reviewed by Dr. Becker

STORY AT-A-GLANCE

- Researchers have begun to unravel some of the mysteries of the giant panda's digestive system. Surprisingly, pandas are not equipped with the gut bacteria necessary to efficiently process their diet of bamboo
- The GI tracts of pandas, including populations and strains of bacteria, are similar to carnivores — not herbivores
- Giant pandas have evolved powerful jaws and teeth to chew bamboo, but their digestive system is a throwback to their omnivorous ancestors
- Giant pandas are an endangered species and gastrointestinal disease is a primary cause of death in both wild and captive bears
- While giant pandas look cuddly and cute, they can be as dangerous as any other bear

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A study suggests that giant pandas have a heck of a time digesting bamboo. Given the tough consistency of this woody plant, this isn't really surprising ... except that bamboo is the bears' main source of nourishment.

The study authors evaluated the bacteria living in the digestive tract (gut microbiome) of giant pandas. They discovered the bears actually have relatively few strains of bacteria that are helpful in digesting fibrous plants like bamboo.

Instead, surprisingly, most of the panda's gut microbiome consists of bacteria normally found in meat-eaters (e.g., *Escherichia/Shigella* and *Streptococcus*).¹

Giant Pandas Haven't Evolved to Digest Bamboo

The researchers believe the meat-digesting bacteria found in the pandas' GI tracts may be remnants from a distant ancestor. Giant pandas evolved from omnivorous bears that ate both plants and meat. According to scientists, pandas probably began eating bamboo about 7 million years ago, and evolved to eat exclusively bamboo about 2 million years ago.

Today's giant pandas spend over half of each 24-hour day eating bamboo. During their evolutionary journey from omnivores to herbivores, the bears developed powerful jaws and teeth to aid in chewing bamboo, as well as enlarged wrist bones called pseudo-thumbs to help grip the stems of the plant.

But despite those physical adaptations, the giant panda's gut still resembles that of a meat-eating carnivore. Incredibly, the bears are able to digest less than 20% of the bamboo they eat.

"Unlike other plant-eating animals that have successfully evolved anatomically specialized digestive systems to efficiently deconstruct fibrous plant matter, the giant panda still retains a gastrointestinal tract typical of carnivores," said lead study author Zhihe Zhang, director of the Chengdu Research Base of Giant Panda Breeding, China.

"The animals also do not have the genes for plant-digesting enzymes in their own genome. This combined scenario may have increased their risk for extinction."²

Lack of Plant-Digesting Gut Bacteria = Evolutionary Dilemma

For their study, the researchers performed DNA analysis on 121 fecal samples from 45 healthy giant pandas at the Chengdu Research Base in China. The group of 45 included 24 adults, 16 juveniles, and 5 unweaned cubs. The samples were collected during the course of one year, in the spring, summer, and late autumn.

The juvenile and adult pandas consumed at least 22 pounds of bamboo and bamboo shoots each day, plus 1 to 2 pounds of steamed bread. The cubs had just fresh milk from their mothers.

The researchers were surprised to find that the bears' poop was full of undigested bamboo fragments. According to study co-author Xiaoyan Pang, Ph.D., MSc, an associate professor in the School of Life Sciences and Biotechnology at Shanghai Jiao Tong University:

"This result is unexpected and quite interesting, because it implies the giant panda's gut microbiota may not have well adapted to its unique diet, and places pandas at an evolutionary dilemma."

Stuck in Limbo — No Longer a Carnivore, Not yet an Herbivore

The researchers learned that despite their diet, the giant pandas in their study as well as 9 captive and 7 wild adults investigated previously, had relatively few strains of gut bacteria overall. Their GI tracts weren't populated with the plant-digesting strains of bacteria normally found in herbivores, but instead were home to primarily meat-digesting strains.

Structurally, the pandas' guts were unlike other herbivores, and instead were similar to those of carnivorous and omnivorous bears.

The researchers also discovered that giant panda gut bacteria changes with the season. The strains of bacteria in late autumn are very different from spring and summer. This could be because bamboo shoots are out of season in the fall.

Understanding Giant Panda Digestion Can Help Preserve Wild and Captive Populations

The Chinese research team plans a follow-up study to gain a deeper understanding of how the panda's gut microbiome impacts their nutrition and health.

Giant pandas are among the world's most threatened animals, and are listed as endangered on the IUCN Red List.³ Gastrointestinal disease is a primary cause of death in both wild and captive pandas.

The study of the GI bacteria of pandas will assist China's reforestation efforts in the mountainous regions that pandas inhabit. The Chinese government has developed 50 panda reserves within the animals' home range, and has also banned logging to preserve habitats.

5 Fast Facts About Giant Pandas

1. Scientists don't know how long giant pandas live in the wild, but they do know captive pandas live longer. Zoo pandas have been reported to live to be 35.
2. Some experts speculate that the giant panda's bold black-and-white coloring provides effective camouflage in their natural habitat, which are the mountainous regions of central China. The forests the wild giant pandas call home are at elevations of 5,000 to 10,000 feet.
3. While giant pandas look cuddly and cute, they can be as dangerous as any other bear.
4. Giant pandas are about the size of American black bears. They stand between 2 and 3 feet tall at the shoulder (when standing on all 4 legs), and are 4 to 6 feet in length. Males in the wild can weigh up to 250 pounds; females are smaller and typically weigh less than 220 pounds.
5. Giant panda cubs require lots of high-maintenance mothering. At birth, panda babies are utterly helpless, hairless, and blind. They weigh 3 to 5 ounces, which is 1/900th the size of the mother panda — one of the smallest mammal newborns relative to its mother's size. They don't open their eyes until they reach 6 to 8 weeks of age, and they don't start moving around until 3 months of age. They nurse for 8 to 9 months.

Sources and References

[BBC Earth May 19, 2015 \(Archived\)](#).

¹ [mBio 6\(3\):e00022-15](#)

² [EurekAlert!, May 19, 2015 \(Archived\)](#).

³ [IUCN Red List](#)
