



# Treating giant pandas: an unusual advanced role for the gastroenterologist

doi:10.1136/flgastro-2024-102921 Li Luo,<sup>1</sup> Zhiyin Huang ,<sup>2</sup> Colin Rees ,<sup>3</sup> Bi Li,<sup>1</sup> Chengwei Tang<sup>2</sup>

Giant pandas are captivating animals with worldwide interest. Their distinctive colour, furriness and slow, swaggering, lifestyle may be some of the reasons why people love them (figure 1A–C). Fewer than 1900 pandas remain in their natural habitats according to the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. However, in 2016, as a major success of conservation efforts, the IUCN announced a downgrading of the protection status of the giant panda from ‘Endangered’ to ‘Vulnerable’.

All of the world’s Giant Pandas come from Western China. Chengdu Research Base of Giant Panda Breeding (Abbreviated in manuscript as Chengdu Panda Base), situated in Sichuan Province, Western China, is one of China’s premier institutions dedicated to the protection of captive giant pandas (figure 1D,E). It was established in 1987 to safeguard these precious creatures. Commencing with an initial population of six captive giant pandas, the base nurtured and expanded this number up to 244 by 2023, with one of the original six pandas still residing there. Today, the panda base has evolved into a world-renowned tourist attraction

(figure 2A,B), drawing approximately 12 million visitors in 2023.

Pandas have a tendency to suffer from gastrointestinal (GI) problems with around one-third of their medical problems GI in nature. Over the last two decades, an important collaboration has developed between the Chengdu Panda Base and the gastroenterologists at West China Hospital in Chengdu (figure 2C,D). The story began 22 years ago when a number of baby pandas were found to be suffering from watery diarrhoea. Some cases progressed to haemorrhagic diarrhoea with the animals becoming extremely unwell. The Panda vets treated these cases as infectious diarrhoea with most recovering. However, one panda baby worsened, exhibiting curd-like loose stools, abdominal distension and delayed development. Her abdominal circumference measured 100 cm, greater than her body length of 98 cm. As conventional treatments failed, Professor Chengwei Tang, from West China Hospital was consulted. Her team performed abdominal ultrasound and GI endoscopy in the panda base for the first time ever on a giant panda. These investigations, combined with the laboratory data,

suggested that the diarrhoea was not effectively controlled, not because the infection was not well controlled, but because of maldigestion and malabsorption after infective diarrhoea. A regimen of intensive oral nutrition was implemented. The panda gradually improved, recovering completely, and the collaboration between the vets and gastroenterologists was established that thrives to this day.

Giant pandas may suffer from various GI diseases including infections, maldigestion and malabsorption, gastro-oesophageal reflux, peptic ulcer disease, intestinal obstruction, foreign body ingestion, intestinal intussusception, acute pancreatitis and GI tumours. A variety of other systemic diseases may also present with GI symptoms, including loss of appetite and vomiting due to abnormal mucus in stool, haemorrhagic diarrhoea and intestinal obstruction. Loss of appetite is a commonly occurring initial symptom reported by keepers.

Professor Tang and others of the GI team from West China Hospital regularly contribute to the management of Panda GI diseases. Historically, pandas were fed with high protein and starch food that were considered easy to digest,



**Figure 1** Giant pandas (A–C) and Chengdu Research Base of Giant Panda Breeding (D,E).



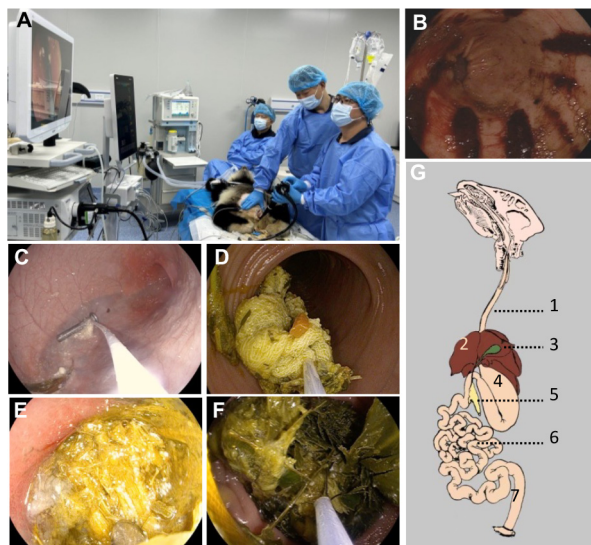
**Figure 2** After attending the Chinese Gastroenterological Conference (CGC) 2024 in Shenyang, Northeast, China, one of the authors of this article, made a special trip to Chengdu to see giant pandas (A,B) West China Hospital in Chengdu (C) and collaborative team in the panda base hospital (D).

hoping to ensure the animals would thrive. However, diarrhoea, maldigestion and delayed development were common problems affecting panda growth. The gastroenterologists advised reconsidering the panda food formula from the perspective of the panda microbiome. Despite the giant panda's digestive system and teeth being anatomically similar to those of carnivores, they have adapted to bamboo as their primary food source for around 3 million years. They become reliant on plants using a unique photosynthetic pathway consistent across diverse time periods and geographical regions.<sup>1</sup> However, the gut microbiome of the giant panda is not adept at degrading cellulose and lignin, the essential components of its bamboo-centric diet.<sup>2</sup> This may be one of the reasons why they have difficulty surviving in the wild. Instead, they have undergone evolutionary adaptations to facilitate the utilisation of more readily digestible carbohydrates, thereby enhancing the extraction of nutrients and energy from bamboo. As a result, the giant panda relies on semi-celluloses and starches liberated by its gut microbiota, rather than solely relying on the breakdown of cellulose.<sup>3</sup> Too much protein and insufficient bamboo may be the cause of the panda's unhealthy gut. Veterinarians and gastroenterologists together worked out the details of optimal dietary formulation for the giant pandas. As food formulations were adjusted, diarrhoea,

maldigestion and stunted development syndrome in pandas reduced significantly. A range of treatments for panda diarrhoea have been established between vets and gastroenterologists. In addition to the laboratory, there are special rooms for endoscopy (figure 3A), ultrasound and CT and operation theatre rooms in the panda base hospital now. Abdominal ultrasound

has become a routine annual diagnostic test for pandas and when there is suspicion of liver and gallbladder diseases.

Pandas are well known for being careless, often falling from great heights (though the vets report that this very rarely leads to trauma or broken bones). This carelessness is also evident in their oral habits, and swallowing of foreign



**Figure 3** Endoscopic photos of pandas and gastrointestinal endoscopy in the panda base hospital of Chengdu. (A) The vet is doing a colonoscopy on the panda in the panda base hospital. (B) Gastric mucosal bleeding. (C,D) Screw and gauze removed from the stomach and colon. (E,F) Bamboo culms and leaves removed from the colon. (G) Anatomy of the digestive system of panda. 1, oesophagus; 2, liver; 3, gallbladder; 4, stomach; 5, pancreas; 6, small intestine and 7, colon.

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bodies is quite common. This can lead to GI bleeding (figure 3B), and on a number of occasions, endoscopy has been needed to remove foreign bodies from the panda (figure 3C,D).

Intestinal obstruction due to various causes is a problem in giant pandas. One female panda aged 18 months developed an intestinal obstruction. At this age, normal pandas can eat as much bamboo as they like. However, her intestinal tract could not tolerate the bamboo in spite of her strong appetite for bamboo. This panda was found to have a spinal lipoma and a mechanical intestinal obstruction was diagnosed by CT, resulting in faeces accumulation in the ascending and descending colon. Enema and tube feeding along with the use of mineral oil and lactulose were all ineffective. Endoscopy was also tried but it did not work because there were too many bamboo shoots and leaves to remove (figure 3E–G). In the past, surgery would have been performed on this panda. However, in conjunction with Professor Tang, a conservative approach using octreotide, parecoxib, antibiotics and temporary parenteral nutrition support was adopted. After 7 days, the panda gradually recovered.

These experiences of treating giant pandas have been shared with colleagues involved in the protection of pandas in China and internationally. Ms Li Luo has worked as a vet at the base for 20 years and is now the chief vet, giving advice on pandas to zoos all over the world. Professor Tang trains up gastroenterologist volunteers to continue working with the panda base. This unique collaboration of clinical gastroenterologists and special vets over the last 20 years has treated numerous pandas and helped to further understand how to best manage these much-loved animals.

**Contributors** LL works as a vet responsible for the diagnosis and treatment of all cases in this paper and wrote the first draft. ZH is the guarantor, a gastroenterologist, and often works as a volunteer with the vets in the panda base. He took part in the treatment of those cases and revised the manuscript and collected the pictures. CR, a gastroenterologist, designed and revised this paper extensively. BL, a vet, has been working with LL for a long time. He assisted with the manuscript writing and data collection. CT is a gastroenterologist and often works as a volunteer with the vets in the panda base. She gave crucial suggestions for all cases in this paper and revised the paper intensively.

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#### ORCID iDs

Zhiyin Huang <http://orcid.org/0000-0002-8322-1786>

Colin Rees <http://orcid.org/0000-0003-3050-8473>

#### REFERENCES

- 1 Han H, Wei W, Hu Y, *et al.* Diet Evolution and Habitat Contraction of Giant Pandas via Stable Isotope Analysis. *Curr Biol* 2019;29:664–9.
- 2 Deng F, Wang C, Li D, *et al.* The unique gut microbiome of giant pandas involved in protein metabolism contributes to the host's dietary adaption to bamboo. *Microbiome* 2023;11:180.
- 3 Zhang W, Liu W, Hou R, *et al.* Age-associated microbiome shows the giant panda lives on hemicelluloses, not on cellulose. *ISME J* 2018;12:1319–28.