

Sacculated Stomach

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The majority of primates have simple stomachs with a baglike structure; however, the leaf-dependent subfamily Colobinae rely on the stomach for most of the digestive process. Colobine monkeys employ foregut digestion (fermenting) with sacculated stomachs that have either three or four chambers. The stomach is three chambered (lacking the front praesaccus) in the genera *Colobus*, *Semnopithecus*, and *Presbytis*, while it is four-chambered in *Procolobus*, *Rhinopithecus*, *Pygathrix*, and *Nasalis*.

The sacculated stomachs in colobines are not like the stomachs found in ruminant mammals like cows and camels. Colobines are classified as nonruminant foregut fermenters and do not generally regurgitate partially digested food to remasticate it. However, regurgitation and remastication (“merycism”) is a strategy that nonruminant foregut fermenters can occasionally employ after excessive feeding to help break down food particles, improving digestive efficiency. Merycism has only been observed in one colobine species (proboscis monkeys, *Nasalis larvatus*) on days with high food intake (Matsuda et al. 2011).

The sacculated arrangement of the colobine stomach evolved to allow them to more efficiently digest their folivorous diet. Leaves contain cellulose and hemicellulose within their cell walls, which are indigestible for mammals without the aid of enzymes produced by symbiotic bacteria. The first two compartments of the colobine sacculated stomach (the praesaccus and saccus gastricus) appear to serve similar purposes in acting as expanding fermenting chambers, though little is known about the functioning of

the praesaccus. Microbial activity is highest in the saccus gastricus where rapid fermentation occurs, producing volatile fatty acids that are readily absorbed into the bloodstream (Kay and Davies 1994). The next compartment, the tubus gastricus, contains bacteria and glands that produce hydrochloric acid, which drops the pH of the material coming from the saccus gastricus. The material then moves to the final chamber, the pars pylorica, which contains mucus-secreting pyloric glands (Ankel-Simons 2007). The pars pylorica is akin to the simple stomach of other primates and completes the digestion process, preparing the broken-down ingested material to enter the small intestine.

SEE ALSO: African Colobines; Asian Colobines; Diets and Nutrition; Folivory

REFERENCES

- Ankel-Simons, Friderun. 2007. *Primate Anatomy*, 3rd ed. Burlington: Academic Press.
- Kay, Robin N. B., and A. Glyn Davies. 1994. “Digestive Physiology.” In *Colobine Monkeys: Their Ecology, Behaviour and Evolution*, edited by A. Glyn Davies and John F. Oates, 229–250. Cambridge: Cambridge University Press.
- Matsuda, Ikki, Tadahihiro Murai, Marcus Clauss, Tomomi Yamada, Augustine Tuuga, Henry Bernard, and Seigo Higashi. 2011. “Regurgitation and Remastication in the Foregut-Fermenting Proboscis Monkey (*Nasalis larvatus*).” *Biology Letters*, 7: 786–789. DOI:10.1098/rsbl.2011.0197.

FURTHER READING

- Chivers, David J. 1994. “Functional Anatomy of the Gastrointestinal Tract.” In *Colobine Monkeys: Their Ecology, Behaviour and Evolution*, edited by A. Glyn Davies and John F. Oates, 205–228. Cambridge: Cambridge University Press.