BioOne COMPLETE

Structure of phytobezoars found in the stomach of a crested porcupine, Hystrix cristata L., 1758

Authors: Mori, Emiliano, and Sforzi, Andrea

Source: Folia Zoologica, 62(3) : 232-234

Published By: Institute of Vertebrate Biology, Czech Academy of Sciences

URL: https://doi.org/10.25225/fozo.v62.i3.a9.2013

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://complete.bioone.org/journals/Folia-Zoologica on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Folia Zool. – 62 (3): 232–234 (2013)

Structure of phytobezoars found in the stomach of a crested porcupine, *Hystrix cristata* L., 1758

Emiliano MORI[1] and Andrea SFORZI[1,2]

[1] *Department of Environmental Sciences "G. Sarfatti", University of Siena, Via P.A. Mattioli, 4 – 53100 Siena, Italy; e-mail: moriemiliano@tiscali.it*
[2] *Museo di Storia Naturale della Maremma, Strada Corsini, 5 – 58100 Grosseto, Italy*

Received 28 March 2013; Accepted 11 June 2013

Abstract. In this note we describe for the first time the inner structure of bezoars found in the stomach of a free-living crested porcupine. These foreign bodies were composed by three concentric layers made up of vegetal matter. The presence of nettle trichomes in the central core, probably due to an accidental ingestion, may have determined the development of these foreign bodies.

Key words: bezoars, foreign bodies, vegetal matter, nettle trichomes

Bezoars are foreign bodies found into the digestive tract of mammal species, made up by hairs (trichobezoars) or indigestible plant matter (phytobezoars). They are variable in size and very compact, with a hard surface. The inner structure is made up of heavily compressed thick fibers intertwined with each other (Sciumè et al. 2004). Phytobezoars are mainly composed by poorly digested fruit and vegetable skins (persimmon, grape, fig, plum, cherry, orange and potato; Holloway et al. 1980). Phytobezoars have been found also in the digestive trait of man (Sciumè et al. 2004, Teng et al. 2005). Phytobezoars were detected both in domestic species, such as sheep and goat (Bath et al. 1992), cow (Martins et al. 2004), buffalo (Veeraiah et al. 2008) and horse (Kellam et al. 2000) and wild species like muntjak, *Muntiacus muntjak* (Sharma & Chauhan 1997), spotted deer, *Axis axis* (Kumar et al. 2000) and Alpine chamois, *Rupicapra rupicapra* (S. Lovari pers. comm.). For medium-sized mammals, as domestic carnivores (cat: Barrs et al. 1999) as well as herbivores (rabbit: Wakamatsu et al. 2001, Guinea pig: Künze & Hitmar 2002), only trichobezoars were recorded. The occurrence of bezoars in a wide range of species with different ecology and digestive system anatomy makes it difficult to clearly interpret their role and their mechanism of formation. The function of bezoars, if any, is still unknown. Some authors hypothesed a connection between their presence and a pathogenetic status of the host (Sciumè et al. 2004). In his "Histoire Naturelle des Quadrupèdes", Georges-Louis Leclerc de Buffon (1799) mentioned the presence of bezoars in crested porcupine, without speculating about the structure and the possible functions.



Fig. 1. Phytobezoars found in the stomach of a female adult crested porcupine (photo IZS).

In this note we describe the inner structure and the content of phytobezoars found in a free-living crested porcupine *Hystrix cristata* L., 1758. An adult female of 14 kg was found dead in a wooded area of the Metalliferous Hills in Southern Tuscany (Prata, Grosseto, Central Italy), in the framework of a research project on the ecology of this species. The animal was subjected to a complete necropsy at the IZS (Istituto Zooprofilattico Sperimentale) veterinary

Downloaded From: https://complete.bioone.org/journals/Folia-Zoologica on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

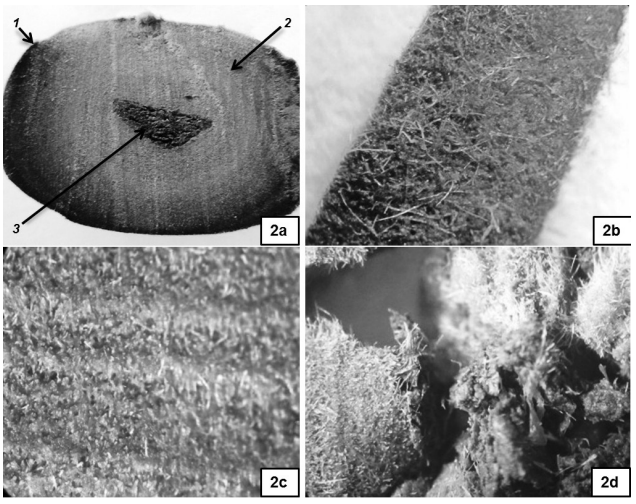


Fig. 2. a) Section of the phytobezoars: 1 = Cortex, 2 = Intermediate layer, 3 = Core, b) Cortex (4× magnification), c) Intermediate layer (4× magnification), d) Core (4× magnification).

labs in Grosseto. Cereals and blackberries were found in its stomach. Crested porcupines feed, indeed, mainly on underground storage plant organs, such as roots and tubers, but also cereal seeds and fruits (Bruno & Riccardi 1995, Riccardi & Bruno 1996). Porcupines are able to digest small quantities of fibers, which are supposed to constitute an important part of the diet only at times of food shortage (Van Jaarsveld 1983). The two phytobezoars found in the stomach were irregularly elliptical (dimensions: about 5 × 5 × 3.5 cm) and greenish in colour (Fig. 1). Presence of phytobezoars in porcupines is supposed to be rare, as these foreign bodies were not found in other 82 necropsies performed on road-killed crested porcupines between 1990 and 2000 in Southern Tuscany (S. Lovari et al., unpublished data).

Phytobezoars were sectioned and observed by means of a binocular microscope. They turned out to be mostly composed by vegetal fibers and structured into three concentric layers (Fig. 2a): i) an external olive-green cortex, made up by less compressed fibers (Fig. 2b), ii) an intermediate bronze-brown layer, made up by very thick vegetal fiber clusters (Fig. 2c), arranged in almost concentric rings around the central core, and iii) a small dark green core, constituted by uncompacted vegetal detritus and some plant hairs (Fig. 2d).

A similar structure was previously reported for bezoars of goats (Bath et al. 1992). A detailed investigation on the core layer composition lead to the determination of the vegetal material as stinging hairs (trichomes) of *Urtica* sp. Nettle has not previously been recorded in the diet of the crested porcupine (Bruno & Riccardi 1995, Riccardi & Bruno 1996), as well as related species (Alkon & Saltz 1985, Skinner & Smithers 1990, Barthelmess 2006).

No lesion was identified in the gastric mucosa. Although phytobezoars occupied *c.* 20 % of the total volume of the stomach (maximum distended stomach volume in porcupines: 1019.1 ± 241 cm^3; Van Jaarsveld 1983, Alkon & Saltz 1985), the individual was in an excellent nutrition status (see Van Jaarsveld 1983). So, phytobezoars are considered incidental findings: the likely cause of death seems to be a pulmonary collapse after a sternal fracture, maybe due to a collision with a vehicle. Even if stinging trichomes evolved as a response to grazing (Tuberville et al. 1996), nettle is included in the diet of many mammals and gastric reactions have never been reported (e.g. Göker & Özmen 2009, Vulla et al. 2009). Thus, we hypothesized that bezoar formation could be due to the mechanical nature of the nettle trichomes, that may have favoured the intertwining of the undigested plant fibers.

Acknowledgements

We would like to thank Rosario Fico and Erika Ciarrocca (Istituto Zooprofilattico Sperimentale delle Regioni Lazio e Toscana) and Lorenzo Peruzzi (Botanic Unit, Department of Biology, University of Pisa) for their qualified helps in the detection and analyses of these structures. Sandro Lovari (Department of Environmental Sciences, University of Siena) kindly revised the first draft of our text.

Literature

Alkon P.U. & Saltz D. 1985: Potatoes and the nutritional ecology of crested porcupines in a desert biome. *J. Appl. Ecol. 22: 727–737.*

Barrs V.B., Beatty J.A., Tisdall P.L.C., Hunt G.B., Gunew M., Nicoll R.G. & Malix R. 1999: Intestinal obstrution by trichobezoars in fide cats. *J. Feline Med. Surg. 1: 199–207.*

Barthelmess E. 2006: *Hystrix africaeaustralis*. *Mamm. Species 788: 1–7.*

Bath G.F., Botha P., Vorster H.J. & Cross R.H.H. 1992: Physical structure and chemical composition of abomasal phytobezoars of goats and sheep. *J. S. Afr. Vet. Ass. 63: 103–107.*

Bruno E. & Riccardi C. 1995: The diet of the crested porcupine *Hystrix cristata* L., 1758 in a Mediterranean area. *Mamm. Biol. 60: 226–236.*

Buffon G.L. 1799: Le Porc-epic. In: Buffon G.L. (ed.), Histoire naturelle des Quadrupedes. *Imprimerie royale, Paris: 4–13.*

Göker B. & Özmen R. 2009: The protective effect of stinging needle (*Urtica dioica* L.) leaf based diet on liver damage caused by acute carbon tetrachloride exposure in rats. *Sağlık Bilimleri Dergisi, Fırat Üniversitesi 23 (2): 77–80. (in Turkish)*

Holloway W.D., Lee S.P. & Nicholson G.I. 1980: The composition and dissolution of phytobezoars. *Arch. Path. Lab. Med. 104: 154–161.*

Downloaded From: https://complete.bioone.org/journals/Folia-Zoologica on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Kellam L.L., Johnson P.J., Kramer J. & Keegan K.G. 2000: Gastric impactation and obstruction of the small intestine associated with persimmon phytobezoar in a horse. *J. Am. Vet. Med. Ass. 216: 1279–1281.*

Kumar R., Nair M.G., Varshney K.C. & Ramalingams S. 2000: Bezoar in a spotted deer (*Axis axis*). *Zoo's Print J. 15: 232.*

Künze F. & Hitmar K. 2002: Ultrasonographic diagnosis of a trichobezoar in Guinea pig. *Wien Tierarztl. Monatsschr. 89 (3): 66–69.*

Martins A.M.C.R.P.F., Leme M.C.M., Portugal M.A.S.C., Baldassi L. & Margatho L.F.F. 2004: Presença de corpos estranhos no habituais no aparelho digestòrio dos bovinos. *Arq. Inst. Biol. 71: 83–87.*

Riccardi C. & Bruno E. 1996: Food intake of captive porcupines *Hystrix cristata* (Rodentia, Hystricidae). *Atti Soc. Tosc. Sci. Nat., Mem. B 103: 81–83.*

Sciumè C., Geraci G., Pisello F., Li Volsi F., Facella T., Mortillaro M. & Modica G. 2004: Corpi estranei gastrici: i bezoari. A proposito di due casi. *Ann. It. Chir. 75: 479–482.*

Sharma S.C. & Chauhan R.S. 1997: Phytobezoars in barking deer (*Muntiacus muntjak*). *Ind. Vet. J. 21: 168–169.*

Skinner J. & Smithers R.H.N. 1990: The Mammals of the southern African subregion. *University of Pretoria, Pretoria, South Africa: 93–97.*

Teng H.C., Nawawi O., Ng K.L. & Yik Y. 2005: Phytobezoars: an unusual case of intestinal obstruction. *Biom. Imag. Interv. J. 1: e4.*

Tuberville T.D., Dudley P.G. & Pollard A.J. 1996: Responses of invertebrate herbivores to stinging trichomes of *Urtica dioica* and *Laportea canadensis*. *Oikos 75: 83–88.*

Van Jaarsveld A.S. 1983: Aspects of the digestion in the Cape porcupine. *S. Afr. J. Anim. Sci. 13: 31–33.*

Veeraiah G., Srinivas M. & Lakshmi Rani N. 2008: Phytobezoar in a she-buffalo – a case report. *Buffalo Bull. 27: 185–186.*

Vulla E., Hobson K.A., Korsten M., Leth M., Martin A.J., Lind A., Mannil P., Valdmann H. & Saarma U. 2009: Carnivory is positively correlated with latitude among omnivorous mammals: evidence from brown bears, badgers and pine martens. *Ann. Zool. Fenn. 46: 395–415.*

Wakamatsu I.M., Assada S., Kuno Y., Takashima K. & Yamane Y. 2001: Clinical evaluation of wool block in 24 rabbits. *Jap. Vet. Med. Ass. 55: 357–363.*

Downloaded From: https://complete.bioone.org/journals/Folia-Zoologica on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use