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Gut Passage Rate in Guenons and Mangabeys: Another Indicator of a Flexible Feeding Niche?

Key Words

Gut passage rate

Diet

Digestibility

Frugivory

Folivory

Cercopithecus

Lophocebus

Mangabeys

Guenons

Introduction

Recent work on the feeding ecology of arboreal guenons and mangabeys in Central Zaire showed that these normally frugivorous species [1, 2] fed largely on leaves, arils and seeds and ate only 5–12% fleshy fruit [3; unpubl. data]. Two main factors affect the level of available nutrients in a plant: firstly its digestibility, which depends largely on cell wall content and secondly the gut passage rate (GPR) of the consumer [4]. Leaves, which have a higher proportion of cell wall material than succulent fruit, require a longer time in the gut for efficient digestion [4, 5].

Studies of GPR conducted on primates [5–8], including both frugivorous and omnivorous species, show that (1) when monkeys are

fed fresh plant material, a slower GPR is in general linked to larger body size; (2) among animals of similar size, more frugivorous species have a faster GPR than more folivorous species [4, 8].

GPR has never been studied in arboreal guenons and mangabeys. An experiment was thus conducted to see whether these species, which display high dietary flexibility, have a GPR within the range of 'typical' frugivores.

Methods

Trials were conducted with 2 male *Cercopithecus (mona) pogonias*, 1 male *C. (cephus) ascanius*, 1 male *C. (cephus) erythrotis* and 2 female *Lophocebus albigena*, all adults living at the breeding colony at the Station Biologique of Paimpont, France. These species are

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taxonomically very close to those of the Zaire Basin [*C. (mona) wolffi*, *C. (cephus) ascanius*, *L. aterrimus*]. The food types comprising their normal diet were individually weighed.

Known numbers of circles (5×0.09 mm) of coloured plastic ribbon were concealed in a banana and fed to the monkeys just before their daily meals. They were highly visible in faeces, easily quantified, and such flexible markers are known to have a GPR independent of their size [9]. Two trials were run: monkeys were given markers on day 1 at 11 h a.m. and (after all of the first batch of markers had been passed) on day 3, at 5 h p.m., as GPR can vary with meal times [8]. All faeces passed after feeding with markers were washed over a 1.5-mm screen. The time of each defecation and the number of markers in each batch of faeces were recorded until they had all been passed [10].

The following data were obtained: (1) mean retention time (MRT), calculated as follows: $MRT = \Sigma m_i t_i / \Sigma m_i$; where m_i = numbers of markers excreted at the i th defecation at time t_i after the marked food had been ingested [11]; MRT is considered to be the best measure of GPR [10]; (2) transit time (TT) = time between ingestion and appearance of the first marker.

Results

The food given to the captive monkeys consisted of 36% fresh fruit, 29% raw vegetables, 15% cooked potatoes and 20% commercial monkey chow (expressed as the percentage of total weight).

MRT and TT for mangabeys were 38 ± 6.5 and 22.7 ± 4.5 h, respectively (\pm standard error). The guenons had somewhat shorter GPRs; MRT was 26.7 ± 3.7 h for *C. (cephus) ascanius* and *erythrotis* and 26.9 ± 6.7 h for *C. pogonias*. TT was 20.6 ± 0.5 h for *C. (cephus)* spp. and 16.6 ± 2.6 h for *C. pogonias*.

Discussion

The GPRs of the guenon and mangabey species were much slower than those observed for 'frugivores' of similar size such as *Lago-*

thrix (TT of 6.7 h), *Ateles* (MRT of 8 h; TT of 4–5 h) or *Cebus* (TT of 3.5 h) [5]. They are closer to those found in more omnivorous species which are known to feed on over 40% leaves, such as *Alouatta palliata* and *A. seniculus* (MRT of 18–30 h; TT of 20.4 h) [5, 6] or *Nasalis larvatus* (MRT of 49 h; TT of 14 h) [7]. One cannot exclude the possibility that captivity modifies GPR, which is positively related to the proportion of dietary fibre in primates and other mammals [10, 12, 13]. However, it has been shown that captive monkeys fed on diets very similar to those of this study [5] had very different transit times depending on the species.

Although these results should be extended before using them to time digestibility assays, they provide a strong indication that free-living guenons and mangabeys are capable of coping with seasonally leaf-dominated diets; in Zaire they were observed to consume 31% leaves over a 3-month period [3, unpubl. data].

The results of this experiment, combined with those from field studies in Zaire [3], confirm that both the classification of primates into ecological 'grades' and inferred relationships between gut morphology and diet [14] need to be treated with caution [3]. They also support Chapman and Chapman's opinion [15] that primate diets are not tightly constrained by phylogeny or even by body size into these grades.

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