

Why nectar-feeding bats need a 'power drink' to fly

Nectar-feeding bats burn sugar faster than any other mammal on Earth – and three times faster than even top-class athletes – ecologists have discovered. The findings, published online in the British Ecological Society's journal *Functional Ecology*, illustrate that because they live life on an energetic knife edge, these bats are very vulnerable to any changes in their environment that interrupt their fuel supply for even a short period.

Working with a captive breeding colony in Germany, Dr Christian Voigt of the Leibniz Institute for Zoo and Wildlife Research in Berlin and Professor John Speakman of the University of Aberdeen fed long-tongued bats (*Glossophaga soricina*) sugar labelled with non-radioactive carbon-13 and then measured the amount of carbon-13 in the bats' exhaled breath.

“We found that nectar-feeding bats made use of the sugar they were drinking for their metabolism within minutes after drinking it, and after less than half an hour they were fuelling 100% their metabolism from this source. For comparison, the highest rates reported in humans are for athletes who can fuel up to 30% of their metabolism directly from power drinks,” they say.

The reason these bats live on such an energetic knife edge is down to the food source they live on and the way they get around. They feed on floral nectars that contain simple sugars such as sucrose, glucose and fructose, but which are produced in only very small amounts by flowering plants. These sugars are rapidly absorbed and digested, and by metabolising them directly – rather than converting them to fat or glycogen and then using them up later – the bats get the maximum energy they can from the sugars. This is important because they hover like humming birds, and this kind of flight uses up a great deal of energy.

According to Voigt and Speakman: “All animals need energy to power their metabolism. Ultimately this energy comes from food, but usually only a small fraction of the energy being used comes directly from the food. Normally, most of the food is converted into storage and this is drawn on later to fuel metabolism. Small nectar-feeding bats have among the highest metabolic costs among mammals, and mostly eat a diet low in fat and protein but rich in sugars. Metabolising these sugars immediately they are consumed saves the costs of converting them to and from storage.”

In a second experiment, Voigt and Speakman measured how fast the bats used their meagre fat stores. “We found the bats depleted almost 60% of their fat stores each day, but even this phenomenal rate was still barely enough to sustain their metabolism when nectar was absent. This underlines how accurately these bats must balance their energy requirements every day and how vulnerable they are to ecological perturbations that might interrupt their fuel supply for even a short period,” they say.

Nectar-feeding bats live in south and central America and are among the smallest of all living mammals, weighing less than 10g. They feed at night and can ingest up to 150% of their body weight as nectar.

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