

INSIDE JEB

Asian elephants have less fat than average human



A male Asian elephant (*Elephas maximus*) called Hank wearing an activity tracker on his front leg. Photo credit: Columbus Zoo and Aquarium, USA.

Daniella Chusyd thought her graduate career was on a predictable course when she was accepted a place on the PhD programme at the University of Alabama at Birmingham (UAB), USA. ‘I intended to study exercise and nutrition/body composition in people’, she recalls. But a 5 week internship in Tanzania threw Chusyd’s plans into confusion. ‘I’ve always been into animals’, she admits, but her experiences in Africa working on human/elephant conflict triggered a rethink. ‘I realised my passion was elephants’, she says. Contacting elephant reproduction expert Janine Brown at the Smithsonian Conservation Biology Institute, USA, Chusyd and Tim Nagy (UAB), discussed the possibility of combining their interests in nutrition and elephants. ‘I started to see parallels between human and elephant health’, Chusyd recalls, learning that many captive elephants are thought to be overweight. In addition, the animals’ low birth rates suggested that they may be facing a fertility crisis similar to that in humans. ‘I was interested in discovering whether methods predominantly used in human health research could help us learn more about elephants’, says Chusyd, who decided to

learn about the relationship between the amount of fat carried by the animals and their health.

‘Obesity is not clearly defined in humans, let alone elephants’, she says, adding that no one had directly measured how much fat captive Asian elephants (*Elephas maximus*) in zoos carry. However, Chusyd and Nagy suspected that they could get a reasonably accurate estimate by paradoxically measuring the amount of water in the elephants’ bodies, which they could then subtract from the body mass to calculate the animals’ fat levels. The best way to measure body water is to give an animal a dose of so-called heavy water, although that is easier said than done; there can be no spillages. ‘We came up with the idea of using bread soaked with heavy water to deliver it to the elephants’, she chuckles, explaining that the animals are particularly partial to the treat; ‘I quickly became their best friend’, she smiles. The animals’ keepers also collected blood samples before and up to 20 days after the elephants consumed the heavy water, to track the quantity of heavy water in their bodies.

Returning to UAB with the samples from zoos across the USA and Canada, Chusyd analysed them with support from Catherine Hambly and John Speakman at the University of Aberdeen, UK. Calculating the animals’ body water and fat content, they found that on average the males carried slightly less fat (~8.5%) than the females (~10%) – healthy humans average 6–31% fat. Overall, the females’ body fat ranged from 2% to 25%, although the males were larger and carried more total fat. But how did the animals’ fat levels correlate with their overall fitness and fertility?

Fitting each animal with an elephant-sized fitness tracker, the team was pleased to see that the captive animals were walking similar distances (between 0.03 and 2.8 km each hour) to free-ranging animals, with the youngest elephants walking the farthest. In addition, when David Allison, Lilian Gozarri-Arroyo and Stephanie Dickinson (from UAB) compared the females’ fertility, they were surprised that the infertile females carried the least fat, more similar to the disrupted fertility cycles of underweight female humans.

However, when the team compared the animals’ insulin levels, the fattest elephants tended to have the highest insulin levels. ‘It is possible that elephants could develop a diabetic-like state’, says Chusyd, adding that the jury is still out on whether captive Asian elephants experience obesity. But when it comes to the care provided by zoos for the majestic mammals, Chusyd says, ‘They are doing a great job ... they know their individual elephants best’, adding that activity seems to be the key to keeping elephants in shape.

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