

INSIDE JEB

Ecotourism causing northern Bahamian rock iguana's sugar high



A northern Bahamian rock iguana on one of the Exuma Islands. Photo credit: Spencer Hudson.

As the old English saying goes, ‘a little of what you fancy does you good’, but the current human type 2 diabetes epidemic suggests that you can have too much of a good thing. ‘A prolonged high sugar diet can “exhaust” the ability to regulate blood glucose’, says Susannah French from Utah State University, USA. In addition, the human obsession with feeding wildlife may be placing other species at risk from unbalanced diets: ‘Catalina Monzon-Arguello and colleagues discovered in 2018 that juvenile green sea turtles in the Canary Islands have high fat and cholesterol levels in their blood as a result of being fed by tourists’, says French. Northern Bahamian rock iguanas on the Exuma Islands are also familiar with sightseers. ‘Many visitors take day boat trips to visit and feed the iguanas’, says French, explaining that the tourists ply the iguanas with grapes. The question was how much of an impact the sugar-charged diet is having on the reptiles’ health? But first, Dale Denardo from Arizona State University, USA and French needed to know how captive iguanas would respond to a high sugar diet.

‘We chose to study the more common green iguana in the lab, because rock iguanas are critically endangered’, says French, who supplemented the youngsters’ usual ‘Tortoise Diet’ and greens meals with either a high (5 g kg^{-1}) or low (2.5 g kg^{-1}) glucose drink. ‘The low dose provides glucose in an amount similar to that found in consumed grapes’, says Denardo. Then, after 17 days, he gave each iguana an intermediate strength glucose drink (3.75 g kg^{-1}) and monitored the animals’ blood glucose over the following 2 days. The reptiles’ glucose levels peaked 3 h after consuming the sugar; however, the iguanas that had been fed the high glucose diet had the most difficulty regulating their blood sugar levels, reaching $\sim 520 \text{ mg dl}^{-1}$, in contrast to iguanas that had been fed Tortoise Diet and greens alone, whose levels peaked at only $\sim 420 \text{ mg dl}^{-1}$. A high glucose diet seemed to impact the captive iguanas’ ability to regulate their blood glucose levels after a meal. But what about the wild iguanas on the Exuma Islands?

French, Denardo and colleagues from various institutions from the USA travelled to the remote islands. ‘When we pull up onto picturesque sandy beaches on the tourist islands, the sound of the boat motors draws the iguanas down, but landing on the islands where tourists do not travel requires carefully timing your jump from the boat’, French recalls. Gently capturing 48 rock iguanas, 24 from islands frequented by tourists and another 24 from islands that are too rugged for tourists to reach, the team fed each iguana a glucose drink and monitored their blood sugar responses for almost a day; the results were concerning. The iguanas from one island where they are fed frequently by tourists experienced the highest glucose peak $\sim 570 \text{ mg dl}^{-1}$ after 5 h, remaining high 8 h later, although the grape-fed iguanas from another island had a less extreme response ($\sim 505 \text{ mg dl}^{-1}$ after 5 h). In contrast, the blood sugar of the iguanas from the islands that rarely see tourists was much lower (peaking at $\sim 450 \text{ mg dl}^{-1}$), rose at a slower rate and returned to normal more quickly.

Ecotourists feeding the wild iguanas on the Exuma Islands are definitely affecting the iguanas physically. Now, the question is whether they are also affecting the animals’ health. ‘If these were humans, we would be talking about diabetes; however, it is not yet clear what the health implications are here. That is something we are continuing to work on’, says French.

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French, S. S., Hudson, S. B., Webb, A. C., Knapp, C. R., Virgin, E. E., Smith, G. D., Lewis, E. L., Iverson, J. B. and DeNardo, D. F. (2022). Glucose tolerance of iguanas is affected by high sugar diets in the lab and supplemental feeding by ecotourists in the wild. *J. Exp. Biol.* **225**, jeb243932. doi:10.1242/jeb.243932

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