Vultures and their putrid diet

stomach this

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White-backed Vulture. Future research will reveal the similarities and differences between how New World and Old World vultures handle the bacteria load from their prey.

Vultures feed mainly on carrion, the state of which may be reasonably fresh but more frequently is well beyond putrid. Rotting meat, unsurprisingly, contains a veritable witch's brew of bacteria, other micro-organisms and the toxic molecules they produce as they decompose the carcass. This diet would induce severe and possibly lethal food poisoning in most animals, yet vultures are able to consume it with apparent impunity.

Intrigued by the digestive adaptations that make this distinctive feeding niche possible, a team of Danish and American biologists recently examined the bacteria present in the digestive tracts of two New World species, the Black Vulture and the Turkey Vulture. In order to better understand how vultures' guts function, the researchers examined the bacteria present in two regions: the skin on the vultures' faces, and their large intestines. These correspond with the start and end, respectively, of the vultures' digestive machinery, and so comparisons between them reveal the changes that occur as food is processed along the length of the gut.

One key finding was that the vultures' facial skin hosted a far more diverse community of bacteria compared to their intestines. Whereas facial swabs revealed bacteria from more than 13 different classes, samples from the large intestine consisted predominantly of bacteria belonging to just two. This sharp decrease in bacterial diversity indicates that a vulture's gut acts as a powerful filter of potentially dangerous micro-organisms; of the multitude of bacteria species ingested while a vulture feeds on a carcass, comparatively few survive the passage along the digestive tract.

The bacteria in the large intestines of both vulture species were dominated by members of the Clostridia and Fusobacteria. These classes include some decidedly nasty pathogens, with members of the genus *Clostridium*, for example, being responsible for severe food poisoning, gas gangrene, tetanus and botulism. The latter disease has been responsible for massive avian mortality events; botulism outbreaks in Kazakhstan (1982) and Canada (1997), for instance, each killed around one million waterfowl. Quite how vultures cope with high numbers of these dangerous bacteria in their gut, and the digestive benefits they derive (if any), remains to be determined.

That the chemical environment in a vulture's gut is unusually acidic and harsh is also suggested by another aspect of the team's data. Analyses of samples collected using facial swabs readily revealed DNA from nine different families of mammals, reflecting the species on whose carcasses the birds had been feeding. In contrast – and unexpectedly – mammalian DNA was almost entirely absent from the large intestine samples. The near-complete disappearance of prey DNA along the passage of the digestive tract is unusual, and implies that the DNA molecules are encountering a very harsh chemical environment.

The study by Roggenbuck and colleagues provides intriguing new insights into avian digestive adaptations, and specifically how vultures are able to feed on one of the most digestively challenging food types imaginable. Future research will, no doubt, uncover further interesting facets of these interactions between birds and bacteria, and reveal the similarities and differences between New World and Old World vultures.

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REFERENCE

Roggenbuck, M. et al. 2014. 'The microbiome of New World Vultures.' Nature Communications *5: 5498.*