

The scoop on bird poop: The evolving diversity of microbial life in bird guts

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The black-legged Kittiwake and chicks (*Rissa tridactyla*). Credit: Joel White

Gut bacteria are known to have a central role both in human and in animal health. Animals acquire different bacteria as they age but how the microbial communities in the bodies of wild animals change over time is not well understood. Wouter van Dongen and colleagues at the Vetmeduni Vienna have examined the gastrointestinal bacteria of chick

and adult black-legged kittiwakes. Surprisingly, the microbial assemblages of chicks and adults generally differ greatly, with only a few types of bacteria in common. The findings have recently been published in the journal *BMC Ecology*.

Gastrointestinal bacteria are important for digestion, [immune functions](#) and [general health](#). Wouter van Dongen and colleagues from the Konrad Lorenz Institute of [Ethology](#) of the Vetmeduni [Vienna](#) have collaborated with scientists from the Laboratoire Évolution & Diversité Biologique (EDB), Toulouse and from the US Geological Survey, Anchorage to study the cloacal bacterial assemblies of black-legged kittiwakes (*Rissa tridactyla*). The bacteria in the cloaca are known to be similar to assemblages deeper within the gastrointestinal tract, so the researchers examined samples from the cloaca of birds at different ages to look indirectly at [gut bacteria](#).

Flushing bacteria

To obtain bacterial samples, the researchers "flushed" the birds' cloacae by gently infusing a salt solution into the cloacae and collecting the liquid. The bacterial diversity in the cloaca of each bird could be estimated with the aid of molecular genetic techniques. The scientists were able to identify different bacterial assemblages and thus to draw a clear picture of how bacterial communities in bird guts change as the birds age.

From a youthful hodgepodge to a stable community

There turned out to be a great variety of bacterial species in the guts of kittiwake chicks but the assortment in the adults was much less diverse. Astonishingly, the sampled chicks and adults had only seven out of a total of 64 bacteria species in common and some of the bacteria that

were very common in adults were not present in chicks at all. Wouter van Dongen says, "We were very surprised to find that the bacteria in chick gastrointestinal tracts are so different from those in adults. Given that chicks share the nest with their parents and eat food that is regurgitated by the parents, we expected the level of bacterial sharing to be a lot higher." The scientists' findings suggest that young birds are susceptible to many species of bacteria that pass through their gut. As the animals mature, the number of bacterial species decreases. Particular groups of bacteria that stay ultimately form a stable community.

A number of causes

It is known from other studies that the composition of gastrointestinal microbes changes according to the age of the host. The differences may correlate with changes in the birds' gut chemistry over time or with changes in diet or may result from competition between bacterial species. A more developed immune system in adults and the lack of mobility of the young could also play a part. Further studies are needed to determine the causes and consequences of the variation in the bacterial assemblages in guts of wild birds.

More information: van Dongen, W. et al. Age-related differences in the cloacal microbiota of a wild bird species, *BMC Ecology*, 2013, 13:11. [doi:10.1186/1472-6785-13-11](https://doi.org/10.1186/1472-6785-13-11)

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