# Microbiome affects reproduction and investment in the uropygial gland in Great tits

Microorganisms constitute the major part of the earth biomass. The host microbiome, defined as the whole community of microorganisms in contact with an organism, includes pathogenic and commensal microorganisms that are remarkable in their diversity and ubiquity. Parasites influence allocation trade-offs between reproduction and self-maintenance, and many beneficial microorganisms are essential for instance to host digestion and nutrient synthesis. The host microbiome is thus expected to shape the evolution of host life-history traits, although experimental studies from natural systems are still lacking.

We experimentally modified the microbiome of wild breeding Great tits (*Parus major*) by spraying nests with liquid solution that either favoured or inhibited bacterial growth compared to a control. In a first study[1], we found that females from the treatment that decreased bacterial densities in the nests laid eggs with less carotenoid than females from control and favoured bacterial communities treatments. Nestlings exposed to decreased bacterial densities grew faster and were bigger at fledging. Moreover, our analyses revealed that the relationship between investment in reproduction and oxidative damage was affected by the treatments. Adults raising larger clutches suffered higher oxidative damage in control nests, whereas this oxidative cost of reproduction was not detected when we modified the bird microbiome.

In a second study[2], we found that Great tits modified some characteristics of their uropygial gland, an external gland involved in the regulation of feather microbes. Males, but not females, modified the size of their uropygial gland when exposed to higher bacterial densities on feathers. The relative abundance of several chemical compounds from the gland secretions changed in males and females, while others changed only in females when exposed to greater bacterial loads on feathers.

Birds live in a bacterial world composed of commensal and pathogenic microorganisms. This work provides the first experimental evidence for effects of the microbiome on reproduction and investment in a defensive trait (the uropygial gland) in a wild bird, and thus highlights the major effect that the microbiome may have on the evolution of host life-history strategies.

Conception: G.Esteve - Crédits photo: J.Bertrand (EDB)

[1]Functional Ecology 2015, Doi: 10.1111/1365-2435.12404
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[2]BMC Evolutionary Biology 2014, 14:134
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