

# Abstract

Vertebrate intestines are inhabited by taxonomically and functionally diverse communities of bacteria and other microorganisms. While recent advances in sequencing technology have revealed the influence of gut microbiota (hereinafter GM) on the physiology, immunity and behaviour of the host; our current knowledge is based mainly on the study of model organisms that will have a different GM composition than that of wild vertebrates. The work presented here focuses on the study of wild songbird (Passeriformes) GM using next generation sequencing, and compares their GM with that of other vertebrates, including mammals, which have been studied far more than birds. This work focuses mainly on factors that affect GM composition at the inter- and intra-specific levels, including intrinsic regulatory mechanisms of the host (such as genetic, immunological and/or physiological mechanisms), social contacts and environmental factors (including diet). In addition, the stability of GM over time and any changes during ontogeny were also assessed.

The results indicate that songbird GM is dominated by the bacterial phyla Proteobacteria, Firmicutes, Actinobacteria, Tenericutes, Bacteroidetes and Chlamydia, a community that differs from that of mammals. At the interspecies level, GM composition is mainly influenced by phylogeny and less so by sampling site. While ecological factors, and especially diet, are important GM predictors in mammals, the effect of ecological factors, including diet, have a much smaller effect on inter- and intraspecific variability in songbird GM composition. Our data from barn swallows (*Hirundo rustica*) suggest an effect of social GM transmission among adults forming social pairs, as well as trans-generational transmission from a social mother to her own nestlings. At the same time, we observed differing GM in adults and nestlings, with no dramatic change in GM with nestling age, a process previously recognised in mammals. Part of the GM detected appears to remain stable over time, and is therefore suitable for further detailed study. To conclude, our studies demonstrate that songbird GM differs from that of mammals and that the factors influencing GM composition appear to differ from those in mammals, thereby highlighting the importance of studying multiple vertebrate groups (not just mammals) when assessing the effects on GM composition.