Influence of urbanisation on endoparasite load and oxidative damage in bees

Colombo B.[1], De Felice B.[3], Galimberti A.[1,2], Tommasi N.[1,2]
E-mail: b.colombo15@campus.unimib.it
[1] Department of Biotechnology and Biosciences, University of Milano-Bicocca, Milan, Italy
[2] INFN Sezione Milano Bicocca, Milan, Italy
[3] Department of Environmental Sciences and Policies, University of Milano, Milan, Italy

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Abstract:
Pollinator insects are closely related to human wellbeing, indeed they are involved both in ensuring ecosystem functionality and food security. Worldwide, the expansion of urban areas is affecting pollinators biodiversity by selecting those species that better adapt to the anthropic conditions. In this framework we evaluated how these species cope with the main urban stressors (e.g., low habitat availability and high temperatures), also investigating the impact of economic activities such as apiculture. Firstly, we studied whether the endoparasite prevalence in two widespread bumblebee species, *B. terrestris* and *B. pascuorum,* is related to changes in the investigated stressors. Secondly, we evaluated the influence of urbanisation on the stress experienced by *Apis mellifera* and three other species of bees with different nesting and social behaviour, using physiological and morphological biomarkers. For the parasites detection we sampled five workers of both bumblebee species, in 17 different sites spread along an urbanisation gradient in Milan and close areas. We PCR-screened each sample to detect the presence of the most common parasites: *Nosema* sp. (microsporidians), *Crithidia* sp. (trypanosomatids), and *Apicystis bombi* (alveolates). We found that infection rate is not influenced by the urban stressors nor the proximity to honey bees apiary, while it increases with floral abundance. This finding highlights the need to find a trade-off between conservation measures based on resource provision and the drawback posed by parasite infections. For the evaluation of the damage induced by stress exposure we sampled 15 female specimens for each investigated species at 16 sites located both in urban and semi natural landscapes. Three physiological markers of oxidative damage, namely lipid peroxidation, protein carbonylation, DNA double strand break, and the wing asymmetry, a morphological biomarker related development stress exposure, were measured for each specimen. The preliminary results of this study proves that *Apis mellifera*, that typically thrive in urban contexts, experiences a higher oxidative damage in this stressful environment, which may affect fitness and long term survival of the colonies. Overall, our results will provide unedited insights on the effects of urbanisation on pollinators that will help the adoption of proper conservation policies and urban development plans aimed at safeguarding biodiversity.