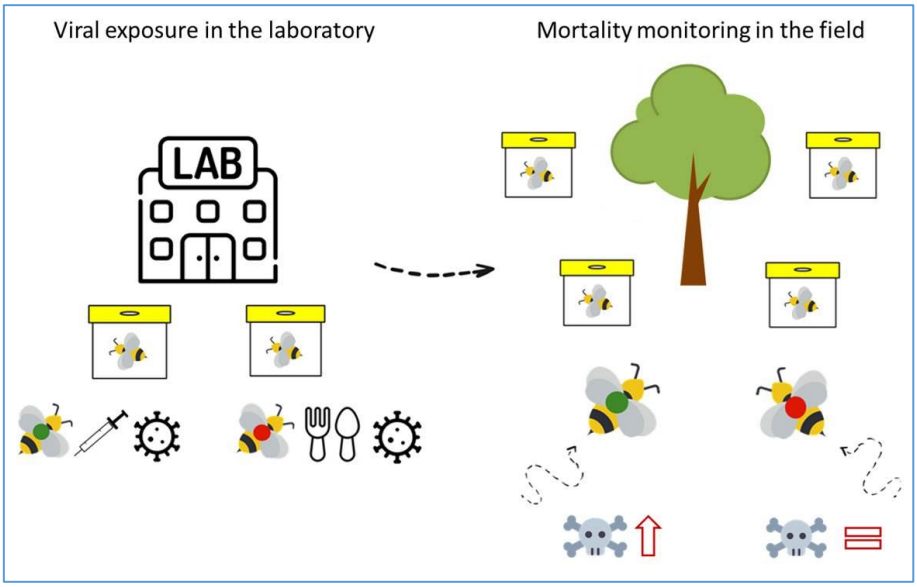
Spillover of virus from honey bees can harm bumble bee workers in the field

INTRODUCTION: Pathogen spillover is when a virus or other disease-causing agent is transmitted from an original host to a new host. It can cause disease outbreaks in wildlife, domesticated animals and humans - witness covid-19. Deformed wing virus (DWV) is notorious for causing disease in the western honey bee (*Apis mellifera*) when transmitted via the parasitic varroa mite (*Varroa destructor*) during its feeding on 'bee blood' (haemolymph). Growing evidence indicates that DWV spills over from managed honey bees into wild bee communities, especially bumble bees (*Bombus* spp.), presumably transmitted at flowers that have been visited previously by diseased honey bees for pollen or nectar. However, our knowledge of the potential negative effects of DWV spillover on bumble bees is limited and largely based on laboratory studies, thus lacking the ecological context known to modulate host-pathogen interactions.



To inform on the impact that spillover may have for bumble bees under field conditions, we inoculated commercially reared bumble bee workers (*Bombus terrestris)* with DWV (genotype A) taken from honey bees, either by feeding or by injecting them with virus, and introduced them into experimental colonies in the field, thus exposing them to the real environment including any stressors. We monitored the survival of inoculated bumble bees and quantified the intensity of their viral infection at 10 days post inoculation to assess the impact of DWV following spillover under these field-realistic conditions.

KEY MESSAGES[1]:

- In *Bombus terrestris* workers injected with DWV-A, virus replicated readily and significantly reduced bee survival compared to controls. Bumble bees fed DWV-A, a more likely transmission scenario, had low or zero detectable viral loads while their mortality did not differ from the control group.
- Our results demonstrate that, although DWV-A is capable of causing disease in *B. terrestris,* the risks for individual fitness from spillover of DWV-A during foraging on flowers shared with the main viral host *Apis mellifera* appear limited.

OUTLOOK:

While host mortality indicates pathogen harmfulness, future studies need to explore additional effects of viral infection on bumble bee performance, especially colony fitness, to broaden our understanding of the consequences of DWV spillover to other pollinators.

[1] Streicher, T., Tehel, A., Tragust, S., & Paxton, R. J. (2023). Experimental viral spillover can harm *Bombus terrestris* workers under field conditions. *Ecological Entomology*, *48*(1), 81-89. (Open Access): https://doi.org/10.1111/een.13203

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