



HAL
open science

Engineered symbionts to safeguard honeybee health and their pollination services: A response

D. Mitchell E. A., A. Aebi, F. Sanchez-Bayo, D. Goulson, N. Simon Delso, R. Brodschneider, Jean-Marc Bonmatin, M. Bijleveld van Lexmond, W. Wenzel K., B. Baer, et al.

► To cite this version:

D. Mitchell E. A., A. Aebi, F. Sanchez-Bayo, D. Goulson, N. Simon Delso, et al.. Engineered symbionts to safeguard honeybee health and their pollination services: A response. eLetters, Science, 2020, 10.1126/science.aax9039 . hal-02498542

HAL Id: hal-02498542

<https://hal.science/hal-02498542v1>

Submitted on 24 Nov 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Engineered symbionts to safeguard honeybee health and their pollination services: A response

Edward A. D. Mitchell, Alexandre Aebi, Francisco Sanchez-Bayo, Dave Goulson, Noa Simon Delso, Robert Brodschneider, Jean-Marc Bonmatin, Maarten Bijleveld van Lexmond, Klaus-Werner Wenzel, Boris Baer, Gérard Arnold, Michael Eyer, Anton Safer

Leonard et al. (1) presented an interesting approach to limit the impact of pathogens on honeybees by stimulating immunity via engineered symbionts. The urgency to safeguard pollinator services is undoubted. Massive declines in bees, insects in general, pose major concerns for ecosystem stability and food production.

However, we see potential pitfalls in such technology driven approaches.

Leonard et al. attribute high honey bee colony mortality to the parasitic mite *Varroa destructor* via synergistic interactions with RNA viruses. However, *Varroa* is only a significant concern for honeybees. The consensus is that pollinator declines are driven primarily by habitat loss and exposure to pesticides (2, 3). The proposed measures will do nothing to aid other insects delivering the bulk of pollination (e.g. (4)).

We caution the release of genetically modified organisms into bees and their environments and identify three main risks:

1. Potential spill over and unknown impact to the health of wild bees. The benefit to bees is thus uncertain.
2. Unpredictable effects for biodiversity, ecosystems and human health: It is impossible to exclude that bacteria with modified genes may cross the species borders through horizontal gene transfer to other microorganisms in the microbiome of bees, other invertebrates, and vertebrates including humans.
3. Potential regulatory and economic consequences: What would happen if traces of GMOs are detected in honey or bee products? Labelling of honey and other bee products as GMOs may be required. This would represent a major blow to beekeepers, a commercial and image disaster.

Efficient *Varroa* control methods or other hive management practices are available to reduce the impact of viruses and colony losses, without the risk of spilling genetically modified organisms.

We propose a discussion to evaluate possible pathways seeking solutions for the pollinator crisis. Broader approaches embracing conservation, socioeconomics and ethical aspects are required.

References

1. S. P. Leonard *et al.*, *Science* **367**, 573-576 (2020).
2. S. G. Potts *et al.*, **25**, 345-353 (2010).
3. D. Goulson, E. Nicholls, C. Botías, E. L. Rotheray, **347**, 1255957 (2015).
4. R. Winfree, N. M. Williams, H. Gaines, J. S. Ascher, C. Kremen, **45**, 793-802 (2008).