



## RECOMMENDATION

# Genetic intimacy of filamentous viruses and endoparasitoid wasps

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**Based on reviews by:**  
Alejandro Manzano-Marín and one anonymous reviewer

**Correspondence:**  
ignacio.bravo@ird.fr

Ignacio G Bravo<sup>1</sup>

<sup>1</sup> MIVEGEC, CNRS – Montpellier, France


### A recommendation of

Di Giovanni D, Lepetit D, Boulesteix M, Ravallec M, and Varaldi J. A behavior-manipulating virus relative as a source of adaptive genes for parasitoid wasps. *bioRxiv* 342758, ver. 5 peer-reviewed and recommended by *PCI Evol Biol* (2018). DOI: 10.1101/342758

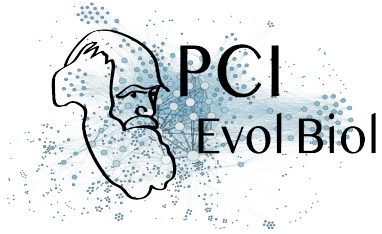
Viruses establish intimate relationships with the cells they infect. The virocell is a novel entity, different from the original host cell and beyond the mere combination of viral and cellular genetic material. In these close encounters, viral and cellular genomes often hybridise, combine, recombine, merge and excise. Such chemical promiscuity leaves genomic scars that can be passed on to descent, in the form of deletions or duplications and, importantly, insertions and back and forth exchange of genetic material between viruses and their hosts.

In this preprint [1], Di Giovanni and coworkers report the identification of 13 genes present in the extant genomes of members of the *Leptopilina* wasp genus, bearing sound signatures of having been horizontally acquired from an ancestral virus. Importantly the authors identify *Leptopilina boulardi filamentous virus* (LbFV) as an extant relative of the ancestral virus that served as donor for the thirteen horizontally transferred genes. While pinpointing genes with a likely possible viral origin in eukaryotic genomes is only relatively rare, identifying an extant viral lineage related to the ancestral virus that continues to infect an extant relative of the ancestral host is remarkable. But the amazing evolutionary history of the *Leptopilina* hosts and these filamentous viruses goes beyond this shared genes. These wasps are endoparasitoids of *Drosophila* larvae, the female wasp laying the eggs inside the larvae and simultaneously injecting venom that hinders the immune response. The composition of the venoms is complex, varies between wasp species and also between individuals within a species, but a central component of all these venoms are spiked structures that vary in morphology, symmetry and size, often referred to as virus-like particles (VLPs).

In this preprint, the authors convincingly show that the expression pattern in the *Leptopilina*

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wasps of the thirteen genes identified to have been horizontally acquired from the LbFV ancestor coincides with that of the production of VLPs in the female wasp venom gland. Based on this spatio-temporal match, the authors propose that these VLPs have a viral origin. The data presented in this preprint will undoubtedly stimulate further research on the composition, function, origin, evolution and diversity of these VLP structures, which are highly debated (see for instance [3] and [2]).

## References

- [1] Di Giovanni D, Lepetit D, Boulesteix M, Ravallec M, and Varaldi J. A behavior-manipulating virus relative as a source of adaptive genes for parasitoid wasps. *bioRxiv* 342758, ver. 5 peer-reviewed and recommended by *PCI Evol Biol* (2018). DOI: 10.1101/342758.
- [2] Heavner ME, Ramroop J, Gueguen G, Ramrattan G, Dolios G, Scarpati M, Kwiat J, Bhattacharya S, Wang R, Singh S, et al. Novel Organelles with Elements of Bacterial and Eukaryotic Secretion Systems Weaponize Parasites of *Drosophila*. *Current Biology* 27 (2017), 2869–2877. DOI: 10.1016/j.cub.2017.08.019.
- [3] Poirié M, Colinet D, and Gatti JL. Insights into function and evolution of parasitoid wasp venoms. *Current Opinion in Insect Science* 6 (2014), 52–60. DOI: 10.1016/j.cois.2014.10.004.

## Appendix

Reviews by Alejandro Manzano-Marín and one anonymous reviewer, DOI: 10.24072/pci.evolbiol.100062