Domestication of viruses by parasitic wasps to deliver virulence molecules and impact on lepidopteran genomes

Jean-Michel Drezen*[1]

[1]Institut de Recherche sur la Biologie de l'Insecte (IRBI) – CNRS : UMR7261, Université François Rabelais - Tours – Avenue Monge 37200 TOURS, France

Abstract

Thousands of wasp species that develop inside caterpillars during their larval stage have domesticated viruses to face host immune defences and thus ensure successful development of their progeny in this potentially hostile environment. Polydnaviruses (PDVs) associated with parasitic wasps are used to transfer and express virulence genes inside the host. Viral particles are injected into the host with the wasp eggs. The genome packaged in the particles comprises multiple circular dsDNA molecules, which are produced exclusively in wasp ovaries from proviral sequences present in the wasp chromosomes. The DNA circles of braconid wasp PDVs get integrated and expressed into host cells. It was found recently that this integration had an unexpected impact on the genome of lepidopteran species. Among PDVs, Bracoviruses (BVs) and Ichnoviruses (IVs) are associated respectively with tens of thousands of braconid and ichneumonid wasp species. The question as to whether PDVs had truly a viral origin has been debated for decades until genomic and proteomic approaches allowed the identification of genes involved in PDVs particles production. It is now clear that BVs and IVs originated by convergent evolution from different viruses, which sets of genes have been well characterized. Recently the origin of the first wasp immunosuppressive particles described was unravelled and shown to correspond to a third event of virus domestication. The recurrent domestication of viruses by parasitoid wasps suggests that virus hijacking allowing genes an/or proteins delivery might be a common evolutionary strategy in intimate antagonistic relationships.

Keywords: parasitic wasps, genomic, viruses

*Speaker