Gut bacteria explain insect tolerance to a toxic diet

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Toxic plant feeders: moth larvae from the Albufera lake, Valencia, Spain. Credit: Asociación RUVID

Scientists at the Universitat de València's Cavanilles Institute have studied the microbial communities of toxic plant feeders in the Albufera lake in Valencia, Spain. Aside from explaining the insects' tolerance to a toxic diet, their findings may have applications in bioremediation: a waste management technique that involves the use of organisms to remove or neutralise pollutants from a contaminated materials.

Specifically, the researchers looked at the bacteria present in the gut of the larvae of two types of moth, Hyles euphorbiae and Brithys crini, which feed exclusively on latex-rich Euphorbia sp. and alkaloid-rich sea

daffodil (*Pancratium maritimum*), respectively. The bacteria are capable of degrading these toxic compounds, which explains how it is that these insects can feed on plants that are generally toxic to insects.

Aside from an understanding of the different mechanisms by which the toxic compounds are rendered harmless to the insect (crystallisation and direct degradation), the work has revealed how an ordinarily generalist bacteria, E. casseliflavus, found in the gut of many an insect, in the digestive tract of the H. euphorbiae becomes pivotal in the detoxification of the ingested latex.

In the words of Cristina Vilanova, "this work characterises and reveals a new relationship between an apparently generalist bacteria and a specialist insect. The microbiota analysed in this study, especially E. casseliflavus, may prove fundamental to understanding the ecology of these specialist insects, as well as being of use in the biotechnology industry. Microorganisms and enzymes that can neutralise alkaloids and latex molecules might find applications in bioremediation, for instance."

Indeed, these findings could be used in the removal or controlled transformation of latex- and alkaloid-based toxic compounds, organic substances found in nature that are the main active ingredients in many common drugs and vegetable toxins.

The insight provided by researchers Amparo Latorre, Joaquin Baixeras and Cristina Vilanova (left) at the Cavanilles Institute, I2SysBio and FISABIO opens up the lines of research focused on gut microbial communities in insects and butterflies. Until now research has focused primarily on species considered agricultural or forestal pests.

More information: Cristina Vilanova et al. The Generalist Inside the Specialist: Gut Bacterial Communities of Two Insect Species Feeding on Toxic Plants Are Dominated by Enterococcus sp., *Frontiers in*

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