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**Abstract**

Herbivores must cope with selection pressures from the species in trophic levels above and below them: their predators, parasites, and parasitoids and the plants they eat. Interesting scenarios where insect herbivores have co-opted plant secondary metabolites, defensive chemicals, for their own defense provide a look at how systems governing nutrient regulation and toxin avoidance may become part of the system regulating the selective intake of non-nutritive compounds, or pharmacophagy. This study looked at the regulation of pharmacophagy in the arctiid caterpillar, *Grammia geneura*, through the context of known systems of nutrient regulation and toxin avoidance.

Interestingly, toxin avoidance mechanisms played a larger role in pharmacophagy than nutrient regulation, despite substantial evidence for preferential feeding on a non-nutritive plant secondary metabolite. This became evident through experiments using the feeding behavior of *Grammia geneura* on controlled dietary regimes in the laboratory and is supported by neurophysiological evidence from previous studies of this species. This study shows that by responding to the trade-off between defense against future risks and optimizing growth efficiency, unparasitized *G. geneura* caterpillars most likely regulate their intake of a plant secondary metabolites such that an individualistic limit is adhered to.