Role of earthworm-gut microbiota in pesticide tolerance ?

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Abstract

Earthworms are important drivers of soil biological properties. Due to their burrowing activities, they are considered as "soil ecosystem engineer". In agricultural fields, they are exposed to insecticides such as organophosphates (OP), which display a high acute toxicity by inhibiting acetylcholinesterase, affecting their nervous system. Moreover, pesticides pose a serious threat to soil microbial processes. Both the assessment of health status of earthworms and the impact of OP on soil enzyme activities has been investigated. However little is known concerning the impact of burrowing activity on the microbiota of the ingested soil during the gut transit. The earthworm digestive tract could be considered as an environmental filter that favors the growth of some microorganisms at the expense of others, possibly controlling activities involved in the degradation of OP. We studied *Allolobophora chlorotica* and *Aporrectodea caliginosa,* two soil-dwelling species abundant in the studied agro-ecosystem. We have previously shown that both the behavior and biochemical responses of A. caliginosa are more sensitive to OP than for A. chlorotica. Here, we aimed to assess the effects of OP on soil, earthworms' intestinal microbiota and casts microbial communities. Both species were exposed for 1-week to parathion. The soil was sampled as a control (day 0), the bulk-soil, and the casts were sampled after 4 and 7 days exposure, then after 5 additional days of gut voiding, the intestinal tract and the fresh casts were collected. We used DNA metabarcoding approach to analyze bacterial and fungal community diversity and we measured their abundances through quantitative PCR. Our results show particular community composition of the digestive microbiota that differ between earthworm species and evidence the environmental filter related to the transit of the soil into the gut. We verified an effect of OP mainly on the fungal community composition of the gut microbiota.

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