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Good News for Entomophagists: Low Chemical Contamination Observed in Edible Insects

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People in many developing countries eat insects as a regular part of their diet, a practice known as entomophagy.[1] Insects are nutritious, generate low greenhouse gas emissions on a per-kilogram basis, and—compared with other livestock—require less feed per quantity of food yielded, a measure known as feed conversion.[1] Yet, as with other food products, the potential exists for insects to become contaminated by environmental pollutants.[2] In a study recently published in *Environmental Health Perspectives*, researchers conducted one of the first dietary exposure risk assessments for edible insects.[3]

The authors of the new study analyzed samples of farmed insects from six commonly consumed orders—crickets and grasshoppers (Orthoptera); mealworms and grubs (Coleoptera); silkworms (Lepidoptera); cicadas (Hemiptera); dragonflies (Odonata); and bees (Hymenoptera). Some of the insects were sold in their natural state, while others were seasoned with flavorings. The insects were purchased in five countries in Europe, where insects remain a niche cuisine, and three in Asia, where entomophagy is common.

The investigators tested the samples for 20 polychlorinated biphenyl ethers, 11 organochlorine compounds, 11 halogenated flame retardants, 17 phosphorous flame retardants, and 18 plasticizers. They also measured biotransformation products of some of the parent compounds and performed a dietary exposure assessment to estimate the intake of the test chemicals.

One of the challenges in the study was that no data currently exist on dietary intake of insects in the countries being studied, so the investigators had to be creative. "The estimation of the dietary intake was deduced following the scenario in which people would suddenly substitute their protein consumption from meat, fish, [and other animal products] with insects," says first author Giulia Poma, an environmental science researcher at the University of Antwerp, Belgium. In other words, the investigators used consumption data for common animal products as a basis for estimating a hypothetical daily consumption of insects. Thus, Poma explains, the estimated dietary intake of contaminants through entomophagy is an overestimation.

Many people in Asia, Africa, and South America eat insects[1] such as these fried silkworms for sale by a street vendor in Thailand. But insects are still a niche market in Westernized countries. Image: © Narongrit Jinasen/Shutterstock.

Contamination varied greatly among countries and among insect orders. Most contamination appeared to arise from post-harvest handling, bolstering evidence that industrial processing is a chief source of contamination in the food supply.[4,5] The plasticizer di-2-ethylhexyl phthalate (DEHP) and aromatic phosphorous flame retardants and plasticizers, such as triphenyl phosphate (TPHP), were the most abundant compounds in all samples.

Overall, the authors found insect contamination to be low and comparable with other animal products. "We could generally state that eating edible insects does not seem to represent a higher chemical risk than the one potentially offered by consuming fish, meat, or other animal protein," says senior author Adrian Covaci, a professor of toxicology at the University of Antwerp.

"The fact that edible insects are equally or even less contaminated compared to common food of animal origin was not surprising, but we were glad to confirm this finding for samples collected outside Europe," says Poma. "Also, we [observed] that higher levels of contamination were generally found in industrially processed samples, confirming the outcomes of our previous investigations."[4]

"We believe that our findings might already contribute to the greater acceptance of insects as an alternative and sustainable food source," she adds. "This will also help improve the attitude of Western countries towards entomophagy."

Regardless of whether entomophagy catches on worldwide, the study contributes new, important knowledge on the chemical safety of edible insects. "The authors used an interesting approach of not only assessing the levels of contaminants in the analyzed food products—as is commonly done—but took this further by performing a dietary risk assessment," says Nathan Meijer, a junior researcher at Wageningen Food Safety Research, the Netherlands, who was not involved in the study. "This paper is therefore a very welcome contribution to the field of the safety of insects for food."

Wendee Nicole, a Houston-based freelance science writer, has written for *Scientific American*, *Nature*, and other publications.

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