



## Pack a Bug in your Lunchbox: Education on Insects as Food and Feed

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“They’re in my hair!” Willie Scott shrieks as seemingly creepy insects and other arthropods crawl all over her in the movie *Indiana Jones and the Temple of Doom*. In media, such as this movie, insects are often depicted in ways that are unrealistically dramatized to evoke disgust. However, much of the aversion to these six-legged critters is undeserved. Insects are necessary to support ecosystem functioning and provide us with goods and services such as pollination, pest control, water filtration, waste management, nutrient cycling, medicinal applications, and more. Recently, researchers have been focusing on another use for insects: eating them.

Research on entomophagy (consuming

insects) as a solution to global warming, resource conservation, and nutrient shortages is gaining prominence in literature. Despite the steady flow of research on this topic, limited educational coverage restricts public awareness and perpetuates Western stigmas against insect consumption. In this article, we explore the environmental, nutritional, and economic benefits, along with the hurdles of promoting entomophagy in American culture. Furthermore, we develop several strategies to promote education about entomophagy and all its applications among the public.

### Benefits and Hurdles

**Environmental Sustainability.** Valerie Stull, an interdisciplinary environmental health

scientist, highlights the untapped potential of insects in sustainable food systems, noting that “We are just scratching the surface of what is possible in using [insects] in a sustainable food systems model.” Insects can bioconvert most organic substrates, including “inedible waste” like cow manure and compost, which reduces overall greenhouse gas emissions from rotting waste while also releasing 45% fewer carbon dioxide equivalents than cattle (Smith 2021). Additionally, Dr. Stull emphasized, “When we think about climate change and the future, we expect more extreme weather events, more droughts, [and] more floods. We need to be very careful about the use of freshwater.” Insects require less water per gram of body mass produced than other

livestock because they extract water from their food and don't require irrigated crop feeds (Huis et al. 2013). However, these clear environmental benefits come with questions about how mass rearing facilities might affect biodiversity, mitigate or experience disease outbreaks, and obtain the energy required for processing. Only more research will answer these questions, but current evidence suggests that edible insects are an environmentally viable option to cut back on resource use in agriculture.

**Nutrition.** Insects are loaded with essential macro- and micronutrients, many of which are currently limited in the diets of some human populations. For example, an insect-based diet could help the elderly, who require more B12 and protein than other populations and struggle to meet those needs (Stover 2010, Norton et al. 2022). The total protein contents of edible insects offer adequate levels of all nine essential amino acids and range from 50–70% of the whole insect, which is higher than beef, eggs, milk, or soy (Li et al. 2023). Larval and pre-pupal insects are rich in fatty acids with antibiotic and prebiotic properties, and adult insects possess high levels of certain vitamins, including vitamins A, B12, and D (Li et al. 2023). Although the bioavailability of these vitamins is still being researched, they remain critical for proper growth and development, such as vision, red blood cell formation, and bone health, respectively. The nutritional value of insects is an important element of entomophagy as demand for healthy protein alternatives grows.

**Economics.** According to Matt Beck, CEO of Hoppy Planet (a company that produces snacks made with protein from house crickets, *Acheta domesticus*), a successful product in business and marketing is one that has multiple benefits from a single purchase and is unique among competing products. Beck believes his cookies and muffins, made with cricket flour, meet these criteria. As he explained, the list of possible ingredients to make a sustainable, nutritional, and unique product “shrinks really fast, and one of the only ingredients you are left with is insects.” He added that the demand for *Acheta* protein is likely to grow by 65% as global protein demand increases over the next 20 years. These factors underscore the compelling economic potential of *Acheta* protein as a unique product with multiple benefits.

## Challenges to the Promotion of Entomophagy

**The “Yuck Factor.”** In Western media, entomophagy is often seen as a dare or a challenge and invokes the “yuck factor,” as many entomologists call it (Kosonen 2022). Disgust is an automatic emotional response rooted in our brains to help us avoid harmful substances and is enhanced by cultural and social learning. Classist stereotypes contribute to the Western aversion to eating insects. Arnold van Huis, an esteemed entomologist at Wageningen University in the Netherlands and a pioneer in the study of entomophagy, recalled learning that entomophagy was quite prominent in Niger during his sabbatical in 1995. This surprised him, as he had worked in Niger for three years a decade prior and had never encountered it. “But then I realized people in Africa don't want to talk about insects as food because they know [Westerners] consider the eating of insects to be a kind of primitive behavior.” In many ways, the yuck factor creates barriers for entomophagy.

**Education.** Edible insects have clear nutritional, environmental, and economic potential, yet they are rarely discussed in public. Part of the reason for this lack of awareness is limited education and

conflicting opinions on how to discuss entomophagy. Insects have been a polarizing topic throughout history, especially during periods of colonization, when Indigenous people were considered “beasts” for consuming insects (Chanca 1906). In an interview, Julie Lesnik, an associate professor at Wayne State University studying multi-species anthropology, described entomophagy education in the context of politics: “When we have these conversations, it's fraught.” Here, Dr. Lesnik is referring to the prejudice against those who traditionally practice entomophagy as being “lesser than,” and the use of insect consumption as a reason for the removal of Indigenous communities during colonization (Lesnik 2019).

So, how do we provide effective educational resources to students and the public that engage them in the conversation? We set out to answer this question through a series of interviews with experts across the field of entomophagy and University of Maryland (UMD) students with varying degrees of entomological background.

## Going Forward

Through conversations with experts and students, we've deduced three key areas to consider going forward in entomophagy



Various edible insects and arthropods used in cooking globally and locally, provided by Aly Moore. (Photo by Helen Craig.)

education: provide positive exposure early and often; improve general insect knowledge; and meet people where they are.

**Provide Positive Exposure Early and Often.** According to John Wilson, an assistant professor at the Department of Food Science and Human Nutrition at Colorado State University, people are experiential learners—our memories are tied to our most powerful experiences. Positive exposure with insects creates fond memories, which opens the door to appreciating, interacting with, and possibly consuming insects. Aly Moore, bug chef and creator of Bugible, emphasized that the most important form of positive exposure is taste. “Food should be a celebratory communication,” she said, referring to the complexity of taste, texture, art, and science that goes into cooking insects.

Regarding positive exposure at an early age, Jeff Tomberlin, a professor at Texas A&M University and director of the National Science Foundation Center for Environmental Sustainability Through Insect Farming (CEIF), said, “If you educate the next generation of consumers, i.e., the children, it becomes normalized, it becomes part of what they do. We’re not trying to teach the parents; we’re trying to teach the next generation.” An example combining Dr. Wilson and Dr. Tomberlin’s guidance is the UMD Insect Zoo, hosted every year by the Department of Entomology on Maryland Day to introduce the public firsthand to the world of insects in a safe, controlled environment. A controlled setting eliminates any surprise factor when encountering insects, which reduces fear and promotes positive memory formation.

**Improve General Insect Knowledge.** Though positive exposure is paramount to reducing insect aversion, knowing more about insects in general is important for developing an appreciation of the benefits these arthropods can provide. From interviewing several UMD students, we noticed that those with more entomological knowledge were more open to insects as an agricultural feed and human food. When asked why she would be willing to eat insects, Luke Humke, a student in the entomology honors program at UMD, even pointed out, “I think it’s because I’m more familiar with them and I grew up with them as a kid. I know they have less complex nervous systems, so I also feel a little less bad [about eating them].” We wouldn’t be consuming the foods we normally eat without knowing what exactly is on our plate, and the same principle applies to insect-based foods.



Home-made guacamole with black ants and crickets at an entomophagy workshop. Black ants are known to provide a citrusy flavor, which is why they are commonly used in guacamole, and crickets add a salty flavor and crunchy texture to the popular dip. (Photo by Angela Saenz.)

**Meet People Where They Are.** Education is essential for acceptance, but it can be overwhelming to dump everything there is to know about edible insects on an uninitiated audience. The best approach is to meet people where they are. Matt Beck states, “The way someone is introduced to insect protein is paramount to whether or not they’re open to eating it and if they’ll continue to eat it.” His philosophy is that a consumer will be more receptive to insect-based foods if they were given a cookie or protein bar made with insect powder rather than whole insects. Promoting entomophagy through familiar food products and brands will likely garner more positive public perception than “foreign” items such as

whole insects or even parts of insects. Change is a gradual multi-step process, and eating foods made from insect powder may eventually develop into whole insect consumption.

## Conclusions

Dr. Stull commented, “We live in the food culture of our specific communities ... there are many ways of eating and many ways of being.” In Western culture, edible insects are not our way of being, at least not now. However, there is always room for change. Spreading knowledge from research and sharing the benefits behind edible insects can emphasize their importance. Early, positive exposure to edible insects coupled with efforts to enhance

general knowledge about all insects and engaging people within their comfort zones are effective strategies for education on this subject, but they are not exhaustive. There are many ways to engage in conversations about entomophagy, and discovering what resonates with each person is a unique and personal experience. For example, there are blogs, research articles, podcasts, reports, videos, and even educational modules available for exploring the world of entomophagy (see recommended reading and resources below).

Exploring different foods is in our nature. At one point, many Americans had aversions to eating lobster or sushi, but now we see them served across the United States. Maybe we can take a page from the past, and who knows? Perhaps the new delicacy of the next decade will be surf, turf, and *and* chirp.

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Shea Ill, an undergraduate volunteer at the University of Maryland, shows off a bess beetle to onlookers. The University of Maryland Department of Entomology hosts many outreach events through the help of the insect petting zoo. This type of outreach is an exceptional example of positive exposure. (Photo by Todd Waters.)

## Recommended Reading and Resources:

### READ—

- Education as a key to promoting insects as food: <https://www.wageningenacademic.com/doi/10.3920/JIFF2021.x007>
- Edible Insects: future prospects for food and feed security: <https://www.fao.org/4/i3253e/i3253e.pdf>
- History and cultural perspectives of Entomophagy: <https://www.mdpi.com/2075-4450/14/8/690>

**LISTEN—**Ologies podcast on Entomophagy Anthropology: <https://www.alieward.com/ologies/entomophagy-anthropology>

**WATCH—**Epicurious, “How To Eat Every Insect”: <https://www.youtube.com/watch?v=JzUuPguQ0pA>

**LEARN—**Aly Moore’s online entomophagy modules: <https://explr-classroom.com/programs/steam-star-aly-moore>

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