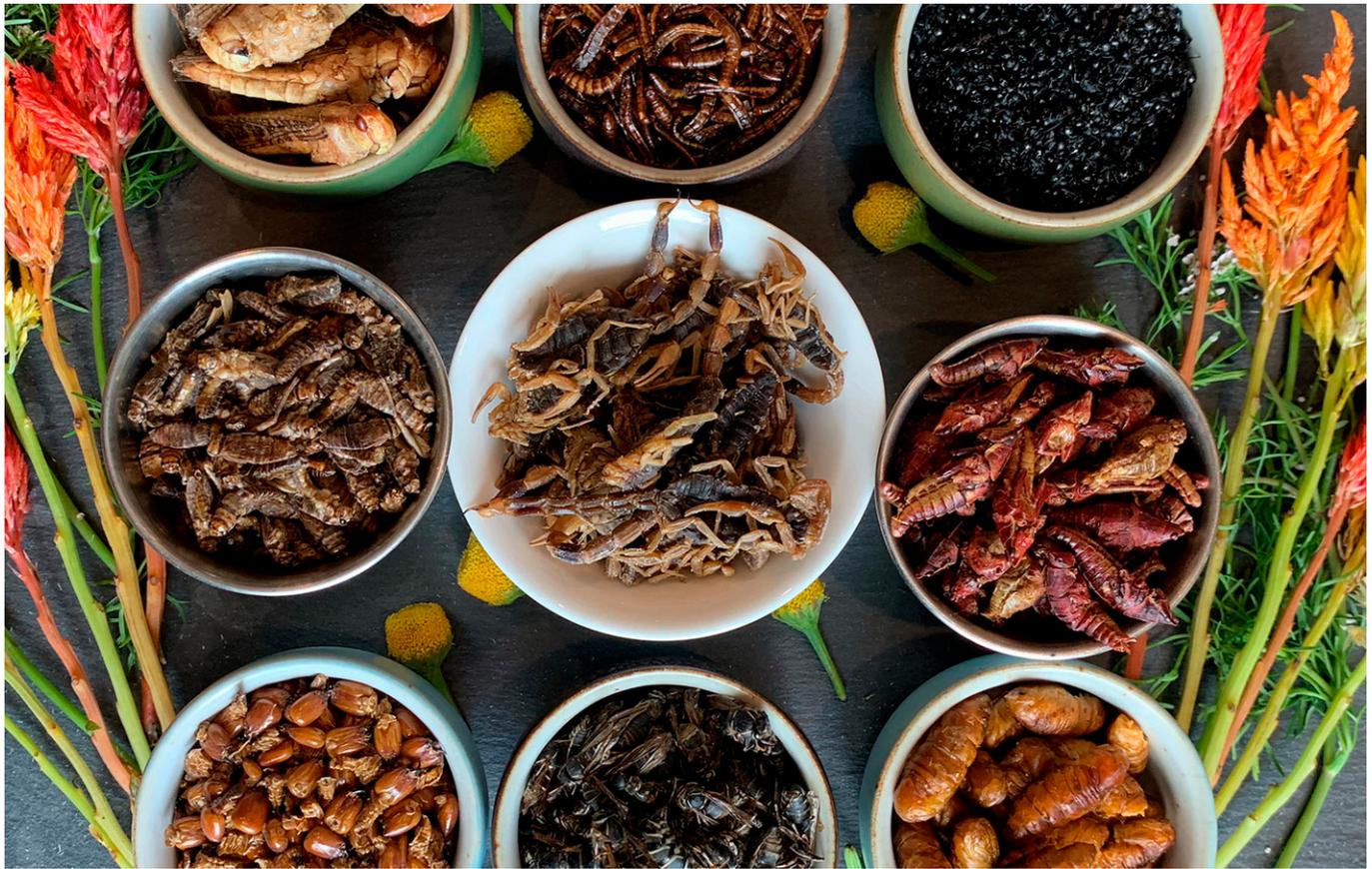


How to convince people to eat insects

Carolyn Beans, Science Writer



On a clear August morning in southeastern Pennsylvania, more than a dozen adults and children stood in a park pavilion, listening to mealworms sizzling in a hot pan. They were learning about entomophagy—the human consumption of insects—from Lisa Sanchez, a naturalist with the Lancaster County Department of Parks and Recreation, who has taught the practice for 25 years.

Suddenly, one mealworm sputtered out of the pan. Six-year-old Adaline Welk—without prompting—popped it into her mouth. The crowd cheered for the newly minted entomophagist. “It’s not that bad!” she exclaimed. “It kind of tastes like kettle corn!”

Sanchez encourages people to eat insects, in part, to lighten environmental footprints. Farmed insects produce far less greenhouse gas and require much less land and water than conventional livestock (1). Insects also generate more biomass with less input. Crickets, for example, are 12 times more efficient than cows at converting feed into edible weight (1).

Already, two billion people eat insects—primarily in parts of Africa, Latin America, and Asia (2). Indeed, the practice dates back millennia (2). “I always thought, even back in the 90s, someday, maybe, [Americans] will do this,” Sanchez says. In principle, millions more people eating protein- and nutrient-rich insects could have a real impact on CO₂ emissions.

The coming years may prove Sanchez right. The edible insect industry is ramping up—one report predicts the market will reach \$9.6 billion by 2030 (3). Consumers can already find foods like salted ants on [Amazon.com](https://www.amazon.com) and cricket powder protein bars in Swiss grocery stores. Recent years have seen numerous

Chefs and others are experimenting with a wide variety of insect ingredients in hopes of convincing curious but wary consumers. Image credit: Brooklyn Bugs.

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Six-year-old Adaline Welk bravely popped a sautéed mealworm into her mouth at a Lancaster, PA park hosting an intro to entomophagy. Image credit: Carolyn Beans.

media stories extolling the virtues of insect-eating, even as converts grapple with the yuck factor.

But before insects can become common fare across the globe, more diners must be convinced that six-legged critters are, in fact, food. Through tasting experiments, surveys, and educational demos, researchers, entrepreneurs, and educators are delving into consumers' psychology to bring reluctant insect eaters to the table. They're learning that resistance can be strong. But even the most hesitant are often converted with clever marketing and an appeal to one powerful motivator: taste.

The First Bite

"Getting over the initial disgust of the idea of eating something that is often thought of as dirty and unclean is a big barrier," says Matthew Ruby, a lecturer in psychology at La Trobe University in Albury-Wodonga, Australia. Ruby found that disgust plays a major role in resistance to edible insects in both the United States and India (4). But researchers are also discovering that disgust wanes once people actually taste insects. In a 2022 Italian study, participants felt less disgust toward consuming insects after eating a sweet energy bar made with crickets—a food the researchers intentionally selected, in part, because of the human preference for sweet things (5). Similarly, in a 2022 Spanish study, volunteers felt more positively about pizza topped with mealworms after tasting it (6). How, then, to get people to take that first bite?

"We repeatedly find that if you don't see the insects, people are much more open to eating it," says Ruby. Through an online questionnaire of 177 American adults, his team found that, on average, individuals were comfortable with the idea of eating cookies containing up to about thirty percent ground black soldier fly larvae added as a flour (7).

"Most people don't want to eat a cow that looks like a cow," says Charles Wilson, founder of Cricket Flours based in Portland, OR. Cricket Flours, started in 2014, does sell whole crickets and black soldier fly larvae for snacking. But they also sell brownie mix enriched with cricket powder (ground cricket), as well as pure cricket powder that

customers can discretely incorporate into baked goods or protein shakes.

The prominence of insects on packaging can also influence consumers, says Dror Tamir, cofounder and CEO of Hargol FoodTech in Israel. "We did a lot of trials working with consumers to have their feedback on how much we should emphasize the grasshoppers," he says. "Having the grasshoppers in front of the package is not a good thing for us."

Hargol, established in 2016, is the first company to raise a species of locust at commercial scale. Its products are primarily sold to other food producers. But it also sells finished products to consumers online through its sub-brand, Biblical Protein. Hargol's chocolate protein shake mix pictures a chocolatey liquid pouring into a glass—no wings, legs, or antennae in sight. The company isn't hiding the insects. (The bottom of the label clearly states: "Locust is a natural high protein source.") But it also isn't leading with them.

Once people do try ground insects, they're often ready to move on to the whole bug, says Chef Joseph Yoon, founder of Brooklyn Bugs, an organization dedicated to increasing appreciation for edible insects. Formerly a private chef, Yoon now conducts insect cooking demonstrations and tastings at schools, universities, and museums around the world. He might offer novices gougères (French cheese puffs) made with cricket powder. "They are usually almost immediately ready to see [the insect]," says Yoon. "They're like, 'I ate that cricket gougères. That was easy. I could eat that all day. Alright, give me something else.'"

Marketing as Usual

But before consumers feel compelled to grab a pack of dried crickets, companies will have to lure them in with advertisements. Researchers are still trying to understand the most effective approach. "Telling people that they should eat more insects because it's good for them and/or good for the planet doesn't seem to have much effect on behavior," says experimental psychologist and gastrophysiologist Charles Spence of the University of Oxford, UK.

In a 2022 study, his team instead tested a tried-and-true marketing strategy: the celebrity endorsement. Using the crowdsourcing platform Amazon Mechanical Turk, researchers presented fictional ads for insect-based foods to more than one thousand people based in the United States (8). Volunteers who saw ads picturing celebrity athletes such as Serena Williams and Roger Federer or actors such as Ryan Reynolds and Angelina Jolie said they were more willing to try the product than those who saw ads without celebrities.

The findings suggest that marketers may not need to reinvent advertising just to sell insects, says Spence. "Why don't we take the most effective food marketing techniques from successful brands that people already know and love and see if they can work for entomophagy?"

Taste Is King

Winning over reluctant insect eaters is easier when food is artistically plated, says Charles X Michel, a chef turned food educator and activist based in France and Colombia. "From a sensory standpoint, from a psychological standpoint, visual cues of food anchor our expectations and they shape our behaviors."



Among the fancy dishes served by the “insect ambassadors” at Brooklyn Bugs in NY is the Manchurian scorpion wonton crisp. Image credit: Brooklyn Bugs.

As cooking contestants on the 2018 Netflix original show *The Final Table*, Michel and colleague Rodrigo Pacheco won the first episode with tacos composed entirely of pre-Colombian ingredients—including crickets wrapped in edible gold. “They looked so beautiful,” says Michel, “like little jewels.”

Once eaters are drawn to that first bite, taste impacts whether they come back for more. Yoon teaches people how to work insects into their kitchens, so they won’t be left disappointed. He explains, for example, that adding cricket powder to marinara sauce adds not only nutrition but umami. Mixing cricket powder and mushrooms with breadcrumbs and other ingredients creates meatballs with the right mouth-feel and texture. Ultimately, he hopes, people will recognize, “Oh, this is satisfying. This is delicious. This is really ... a food!”

Insect tastes and textures need not convince a wary public entirely on their own. Food engineers and entrepreneurs are looking for ways to bring out the best flavor in insect-based products by concocting various mixtures and combinations. Through a taste test at the Sensory Analysis Laboratory at the National University of Agriculture in Olanchito, Honduras, researchers learned that volunteers preferred barbecue sauce containing no more than five percent

cricket flour (9). Above five percent “makes it too viscous and sensorially unattractive,” says study author and food engineer Jhuniar Marcía, noting that other foods like cookies can taste good with higher cricket flour content.

“Taste is king,” says Tamir of Hargol. Grasshoppers, he says, have “umami flavors—mainly mushrooms, pecans, coffee, and chocolate. They enhance meaty flavors.”

Hargol is working with processed meat producers in the United States, Canada, and Asia to develop products like burgers, meatballs, and sausage that will contain chicken, beef, or other protein sources combined with ground grasshopper. One company, Tamir says, is expected to launch the first such product in 2023.

Pointing to a picture of a chicken and grasshopper patty prototype, Tamir outlines Hargol’s selling points: It tastes better than other burgers because of this unique ingredient (which he leaves unnamed.) “And then we can explain, it is better for the environment, it is better for your health.”

Creating a New Norm

Even in regions where entomophagy is traditionally practiced, it’s popularity could be greatly expanded with more resources and infrastructure. “People generally believe

that everybody in Africa eats insects," says Oluwatosin Ibitoye, an entomologist at the Forestry Research Institute of Nigeria in Oyo State. "I believe that it is stratified across age group, culture, and educational background."

Ibitoye surveyed 372 children and adults under the age of 35 in Oyo State in southwestern Nigeria to understand their attitudes toward insect consumption (10). His findings, reported in 2020, show that nearly 70 percent of respondents had eaten insects. But of these, nearly two-thirds no longer did. One of the main barriers respondents cited was access. Foraging for insects takes time. "For you to get crickets, you need to trap them in the holes, probably in the night," explains Ibitoye, noting that young, educated people often don't want to go to the trouble. Many respondents also associated entomophagy with poverty and a lack of education.

Ibitoye would like to see insect farms developed in his country so that people will have more regular access and remain familiar with eating them. "If you don't farm them," he says. "I believe that this culture of eating insects might actually be going down."

Although insect farms are popping up across the globe, the scale of production lags far behind more conventional livestock operations. And this has an impact on prices in the marketplace, says Ruby. "A lot of the insect food products are still quite expensive."

Tamir believes that his own company's production costs will come down now that Hargol has bred grasshoppers

that can survive on dry feed rather than fresh grass. "It reduces feed cost—the main cost driver—by 97 percent," he says. "Once we implement that on the production lines, we will be more efficient than any other animal-based protein source out there."

Watching others enjoy insects could also help. "As eating a particular food becomes more culturally normative, it seems that other people become more willing to try it," says Ruby. "When sushi was first introduced to the U.S. back in the day, it didn't get a very warm reception."

"As eating a particular food becomes more culturally normative, it seems that other people become more willing to try it."

—Matthew Ruby

In Sanchez's entomophagy classes, she always discusses how much she enjoys eating insects herself. She also creates a low-pressure environment, never forcing anyone to try insects, though most, she says, do.

Back at the pavilion in Lancaster County, many followed Welk's lead and sampled the mealworms, and crickets too. Welk's sister, 8-year-old Leona, wasn't so sure. They taste better than sprinkles, Sanchez assured her.

Leona watched as family members and others ate insects, many going back for seconds and thirds. The program was about to wrap up when she finally marched over to the demo table, reached for a mealworm, and ate it. "It didn't taste like anything," she shrugged. "I'm still not putting them on my ice cream."

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