

# Mysterious morel mushrooms at center of food poisoning outbreak

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A food poisoning outbreak that killed two people and sickened 51,

stemming from a Montana restaurant, has highlighted just how little is known about morel mushrooms and the risks in preparing the popular and expensive delicacy.

The FDA conducted an investigation into morel mushrooms after the severe illness outbreak linked to Dave's Sushi in Bozeman in late March and April. The investigation found that undercooked or raw morels were the likely culprit, and it led the agency to issue its first guidelines on preparing morels.

"The toxins in morel mushrooms that may cause illness are not fully understood; however, using proper preparation procedures, such as cooking, can help to reduce toxin levels," according to the FDA guidance.

Even then, a risk remains, according to the FDA, "Properly preparing and cooking morel mushrooms can reduce risk of illness; however, there is no guarantee of safety even if cooking steps are taken prior to consumption."

Jon Ebelt, spokesperson for Montana's health department, said there is limited public health information or medical literature on morels. And samples of the morels taken from Dave's Sushi detected no specific toxin, pathogen, pesticide, or volatile or nonvolatile organic compound in the mushrooms.

Aaron Parker, the owner of Dave's Sushi, said morels are a "boutique item." In season, generally during the spring and fall, morels can cost him \$40 per pound, while morels purchased out of season are close to \$80 per pound, he said.

Many highly regarded recipe books describe sauteing morels to preserve the sought-after, earthy flavor. At Dave's, a marinade, sometimes

boiling, was poured over the raw mushrooms before they were served, Parker said. After his own investigation, Parker said he found boiling them between 10 and 30 minutes is the safest way to prepare morel mushrooms.

Parker said he reached out to chefs across the country and found that many, like him, were surprised to learn about the toxicity of morels.

"They had no idea that morel mushrooms had this sort of inherent risk factor regardless of preparation," Parker said.

According to the FDA's Food Code, the vast majority of the more than 5,000 fleshy mushroom species that grow naturally in North America have not been tested for toxicity. Of those that have, 15 species are deadly, 60 are toxic whether raw or cooked—including "false" morels, which look like spongy edible morels—and at least 40 are poisonous if eaten raw, but safer when cooked.

The North American Mycological Association, a national nonprofit whose members are mushroom experts, recorded 1,641 cases of mushroom poisonings and 17 deaths from 1985 to 2006. One hundred and twenty-nine of those poisonings were attributed to morels, but no deaths were reported.

Marian Maxwell, the outreach chairperson for the Puget Sound Mycological Society, based in Seattle, said cooking breaks down the chitin in mushrooms, the same compound found in the exoskeletons of shellfish, and helps destroy toxins. Maxwell said morels may naturally contain a type of hydrazine—a chemical often used in pesticides or rocket fuel that can cause cancer— which can affect people differently.

Cooking does boil off the hydrazine, she said, "but some people still have reactions even though it's cooked and most of that hydrazine is

gone."

Heather Hallen-Adams, chair of the toxicology committee of the North American Mycological Association, said hydrazine has been shown to exist in false morels, but it's not as "clear-cut" in true morels, which were the mushrooms used at Dave's Sushi.

Mushroom-caused food poisonings in restaurant settings are rare—the Montana outbreak is believed to be one of the first in the U.S. related to morels—but they have happened infrequently abroad.

In 2019, a morel food poisoning outbreak at a Michelin-star-rated restaurant in Spain sickened about 30 customers. One woman who ate the morels died, but her death was determined to be from natural causes. Raw morels were served on a pasta salad in Vancouver, British Columbia, in 2019 and poisoned 77 consumers, though none died.

Before the new guidelines were issued, the FDA's Food Code guidance to states was only that serving wild mushrooms must be approved by a "regulatory authority."

The FDA's Food Code bans the sale of wild-picked mushrooms in a restaurant or other food establishment unless it's been approved to do so, though cultivated wild mushrooms can be sold if the cultivation operations are overseen by a regulatory agency, as was the case with the morels at Dave's Sushi. States' regulations vary, according to a 2021 study by the Georgia Department of Public Health and included in the Association of Food and Drug Officials' regulatory guidelines.

For example, Montana and a half-dozen other states allow restaurants to sell wild mushrooms if they come from a licensed seller, according to the study. Seventeen other states allow the sale of wild mushrooms that have been identified by a state-credentialed expert.

The study found that the varied resources states use to identify safe wild mushrooms—including mycological associations, academics, and the food service industry—may suggest a need for better communication.

The study recognized a "guidance document" as the "single most important step forward" given the variety in regulations and the demand for [wild mushrooms](#).

Hallen-Adams said raw morels are known to be poisonous by "mushroom people," but that's not common knowledge among chefs.

In the Dave's Sushi case, Hallen-Adams said, it was obvious that safety information didn't get to the people who needed it. "And this could be something that could be addressed by labeling," she said.

There hasn't been much emphasis placed on making sure consumers know how to properly prepare the mushrooms, Hallen-Adams said, "and that's something we need to start doing."

Hallen-Adams, who trains people in Nebraska on mushroom identification, said the North American Mycological Association planned to update its website and include more prominent information about the need to cook mushrooms, with a specific mention of morels.

Montana's health department intends to publish guidelines on morel safety in the spring, when morel season is approaching.

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