

Research reveals bed bugs produce potentially dangerous amounts of histamine

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A colony of bed bugs in the entomology lab at the University of Kentucky.
Credit: Matt Barton, UK agricultural communications specialist.

University of Kentucky (UK) College of Agriculture, Food and Environment entomologists made eye-opening discoveries in a recent

bed bug study, finding the bugs produce large amounts of histamine that may pose risks to humans.

Histamine is a chemical compound the human body naturally produces that may cause inflammation and alert the immune system of any threats. Normal reactions to histamine production include allergic reactions with [side effects](#) like rashes or respiratory problems. A [previous study](#) showed links between excess histamine, especially in patients with a histamine intolerance, and [health effects](#) such as headaches, gastrointestinal issues, irregular heart rate and asthma.

Sudip Gaire, post-doctoral scholar in the UK Department of Entomology, and Zach DeVries, assistant professor of entomology, led the study looking at histamine excretion levels of [bed bugs](#) across the bugs' different life stages, different populations and varying lengths of time, and the effects that feeding on blood had on the pests' histamine production levels. The UK-based team also collaborated with scientists from North Carolina State University on the project.

The *Journal of Medical Entomology* recently published the study that showed bed bugs can produce large amounts of histamine, with a single bed bug producing greater than 50 micrograms of histamine in just one week. Researchers found that in a hypothetical infestation of 1,000 bed bugs, the bugs could produce up to 40 milligrams in a week. That adds up to more than 2 grams of histamine per year without even considering natural population growth or the larger infestations that often happen in the real world.

"That's an amount you can actually see, and we don't see that with any other containment," DeVries said. "When we talk about pesticides, allergens, any other thing in our home that some invading organism is producing, it's always on microscopic levels, not something where you could actually hold it in your hand."

Another important discovery was the role that bed bug diets play in histamine production. Researchers compared histamine production across three different diets including blood-fed, saline-fed and starved bed bugs. Researchers found that blood-fed bed bugs produced "significantly higher" amounts of histamine compared to the other groups.

"Blood is the primary factor for histamine production, but we don't know how exactly they are producing the histamine," Gaire said.

While bed bugs are a common problem in households across the globe, scientists typically don't consider them a great risk to human health, aside from their bites, because they are not known to carry any pathogens. However, the issue of high-level histamine production raises a new potential risk from the pest. While scientists don't know the specific health impacts of histamine produced outside of the [human body](#) like bed bugs produce, DeVries, Gaire and their fellow entomologists do suspect that bed bugs' high level of histamine excretion may have negative clinical effects. The effects of such close, often direct, exposure to histamine, commonly seen in bed bug infestations, are also unknown, DeVries said.

"It's not only the fact that they're producing histamine, but they're producing it right next to where you spend the most time, generally speaking, within our homes, which is in our beds or sleeping areas," DeVries said.

Gaire said close exposure to histamine isn't only a concern for humans, but it could also affect the agriculture industry. Poultry houses are a common place for bed bug infestations, with bed bugs living near chickens in infested facilities, Gaire said. In [previous studies](#), researchers found histamine negatively impacts egg production, but Gaire said finding the specific impact bed-bug-produced histamine plays

in egg production requires more research.

DeVries said that the research also has social justice implications.

"Anybody can get bed bugs, but it's only those who have the means and resources who can actually get rid of the problem. There is a significant portion of the population who either don't have the money or the resources to do this, and so they're left to deal with bed bugs on their own," DeVries said. "So, we have disadvantaged communities, who are not only having to deal with bed bugs, but maybe dealing with the health ramifications of them as well."

DeVries and Gaire said that while their study answered important questions, scientists need to do more research before sounding the alarm. To answer some of the remaining questions, DeVries, Gaire and others in the UK entomology department plan to continue research on the topic looking at things like histamine distribution, bed bug histamine production mechanisms, the clinical relevance of [histamine](#) and mitigation strategies in homes.

More information: Sudip Gaire et al, Histamine Excretion by the Common Bed Bug (Hemiptera: Cimicidae), *Journal of Medical Entomology* (2022). [DOI: 10.1093/jme/tjac131](https://doi.org/10.1093/jme/tjac131)

Provided by University of Kentucky

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