Sharing that crowded holiday flight with countless hitchhiking dust mites

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Common dust mites in the home are not actually insects at all. Instead, they belong to the class Arachnids -- which includes spiders and the subclass acarina that includes ticks. Credit: Gilles San Martin via flickr

As if holiday travel isn't stressful enough. Now University of Michigan researchers say we're likely sharing that already overcrowded airline cabin with countless tiny creatures including house dust mites.

"What people might not realize when they board a plane is that they can share the flight with a myriad of microscopic passengers— including house dust mites—that take advantage of humanity's technological progress for their own benefit," said U-M biologist Pavel Klimov.

"House dust mites can easily travel on an airline passenger's clothes, skin, food and baggage," said Klimov, an assistant research scientist in

the U-M Department of Ecology and Evolutionary Biology. "Like humans, they use air travel to visit new places, where they establish new populations, expand their ranges and interact with other organisms through various means."

Air travel likely explains some of the findings of a new genetic study conducted by Klimov and U-M visiting scholar Rubaba Hamid that looked at the connections between house dust mite populations in the United States and South Asia.

They found genetic mutations shared by mites in the U.S. and Pakistan that demonstrate the eight-legged creatures' propensity for intercontinental dispersal, according to a research paper scheduled for online publication Dec. 10 in the journal *PLOS ONE*.

"What we found suggests that mite populations are indeed linked through migration across continents, though geographic differences still can be detected," Hamid said. "Every time a mite successfully migrates to a new place, it brings its own genetic signature that can be detected in the resident population a long time after the migration event."

The study focused on two medically important mite species, the American and European house dust mite. Both species have global distributions, though the former is more abundant in the U.S.

Ancestors of the two species probably separated from each other nearly 81 million years ago—long before the origin of humans—when they inhabited bird nests. Today, house dust mites are blamed for causing allergic reactions in more than 65 million people worldwide and thrive in the mattresses, sofas and carpets of even the cleanest homes.

Hamid, Klimov and their colleagues examined genetic variation in the group 1 allergen gene from samples of the two mite species collected in

the U.S. and Pakistan. The group 1 allergen gene encodes for the most important allergy-causing protein in house dust mites.

An inactive form of this protein is used in clinics worldwide as part of the standard skin-prick test for allergies. Though the test can be inaccurate if it does not include local genetic variants of the allergy-causing protein, geographical variation in group 1 allergen proteins has not been extensively studied in the U.S., Klimov said.

"We need to have a better idea about the diversity of allergenic proteins around the world, and particularly in the United States," he said.

In genetic sequences from American house dust mites (*Dermatophagoides farinae*), the researchers observed mutations at 14 positions along the length of the group 1 allergen gene.

All but one of the mutations are "silent," meaning they occur at the DNA level without changing the amino acid structure of the protein. Only mutations at the protein level have medical significance because they can change allergenic properties.

"The most unexpected result was the finding that a previously unknown mutation occurred at the active site of the protein at position 197," Klimov said. "This was a rare mutation, found in only a single population of house dust mite in South Asia.

"Our analysis indicates that this mutation might alter the enzyme activity of the protein. But allergenic properties, immune response and cross-reactivity of the protein are unknown at this time," he said. "Follow-up experiments to elucidate these issues are underway in our lab."

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