

# Crib mattresses emit potentially harmful chemicals, engineers find

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In a first-of-its-kind study, a team of environmental engineers from the Cockrell School of Engineering at The University of Texas at Austin found that infants are exposed to high levels of chemical emissions from crib mattresses while they sleep.

Analyzing the foam padding in crib mattresses, the team found that the mattresses release significant amounts of [volatile organic compounds](#) (VOCs), potentially harmful chemicals also found in household items such as cleaners and scented sprays.

The researchers studied samples of [polyurethane foam](#) and polyester foam padding from 20 new and old crib mattresses. Graduate student Brandon Boor, in the Cockrell School's Department of Civil, Architectural and Environmental Engineering, conducted the study under the supervision of assistant professor Ying Xu and associate professor Atila Novoselac. Boor also worked with senior researcher Helena Järnström from the VTT Technical Research Centre of Finland. They reported their findings in the February issue of *Environmental Science & Technology*.

The researchers found:

- New crib mattresses release about four times as many VOCs as old crib mattresses.
- Body heat increases emissions.
- Chemical emissions are strongest in the sleeping infant's immediate breathing zone.

The researchers concluded that, on average, mattresses emitted VOCs at a rate of 87.1 micrograms per square meter per hour, while older mattresses emitted VOCs at a rate of 22.1 micrograms per square meter per hour. Overall, Boor said crib mattresses release VOCs at rates comparable to other consumer products and indoor materials, including laminate flooring (20 to 35 micrograms per square meter per hour) and wall covering (51 micrograms per square meter per hour).

Boor became motivated to conduct the study after finding out that [infants](#) spend 50 to 60 percent of their day sleeping. Infants are considered highly susceptible to the adverse health effects of exposure to indoor air pollutants.

"I wanted to know more about the chemicals they may inhale as they sleep during their early stages of development," he said. "This research

also helps to raise awareness about the various chemicals that may be found in crib mattresses, which are not typically listed by manufacturers."

The 20 mattress samples are from 10 manufacturers. The researchers chose not to disclose the names of the manufacturers studied so that their results could draw general attention to the product segment without focusing on specific brands.

At present, not much is known about the health effects that occur from the levels of VOCs found in homes, according to the U.S. Environmental Protection Agency.

Among the many chemicals considered VOCs are formaldehyde, benzene, toluene, perchlorethylene and acetone. The crib mattresses analyzed in this study did not contain those organic compounds.

The researchers identified more than 30 VOCs in the mattresses, including phenol, neodecanoic acid and linalool. The most abundant chemicals identified in the crib mattress foam, such as limonene (a chemical that gives products a lemon scent), are routinely found in many cleaning and consumer products.

Chemist and indoor air quality expert Charles J. Weschler, adjunct professor in environmental and occupational medicine at Rutgers University, said he does not think the levels of chemical concentration found in the mattresses are alarming, but he considers the research valuable.

"It's good to be alerted to the fact that crib mattresses are a significant source of chemicals in an infant's environment," said Weschler, who noted crib mattresses might one day be analyzed for noxious chemicals as a result of such research.

The researchers found that VOC levels were significantly higher in a sleeping infant's breathing zone when compared with bulk room air, exposing infants to about twice the VOC levels as people standing in the same room. Additionally, because infants inhale significantly higher air volume per body weight than adults and sleep a longer time, they experience about 10 times as much inhalation exposure as adults when exposed to the same level of VOCs, the researchers said.

"Our findings suggest the reuse of an older crib or an extended airing-out period may help reduce infant VOC exposures," said assistant professor Ying Xu.

Although used mattresses may appear to be a good alternative, the researchers noted that older mattresses might contain other harmful chemicals such as flame retardants now banned in mattress foams.

Understanding the sleeping environment is important to the health of infants and adults, added Richard Corsi, chair of the Department of Civil, Architectural and Environmental Engineering.

"We need to better understand the complex sleep microenvironment to improve it and reduce the harmful effects of related pollutants on infants," Corsi said.

Provided by University of Texas at Austin

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