



Disinfectant Causes Reproductive Problems in Mice

Mice exposed to disinfectants in commercial-grade cleaning products took longer to get pregnant, had fewer pups and suffered more miscarriages and distressed fetuses

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Mice exposed to disinfectants in commercial-grade cleaning products took longer to get pregnant, had fewer pups and suffered more miscarriages and distressed fetuses, researchers reported today.



The little-known chemicals, called quaternary ammonium compounds, or quats, are common ingredients of cleaners used by hospitals, restaurants and food processing plants. Quats also are found in some shampoos, disinfectant wipes and nasal sprays.

Credit: Thinkstock

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The chemicals have been in widespread use for decades. But the new study is the first to look at the reproductive toxicity of newer quat combinations found in cleaning products, according to the researchers from Virginia Tech and Washington State University.

“It’s impossible to say what exposure at these levels means for humans,” said study coauthor Pat Hunt, a geneticist at the Washington State University. “There’s been so little research on these compounds that we don’t have a good handle on how we’re even exposed.”

Pregnant women and developing fetuses can be particularly vulnerable to such exposures. “It underscores once again that exposures to certain chemicals during pregnancy can have detrimental effects,” said Dr. Linda Giudice, a reproductive endocrinologist at the University of California, San Francisco who was not involved in the study.

For six months, the researchers fed 10 breeding pairs of mice a combination of two quats—alkyl dimethyl benzyl ammonium chloride (ADBAC) and didecyl dimethyl ammonium chloride (DDAC)—commonly used to disinfect laboratories and healthcare settings.

Exposed mice took 31 days to birth their first litters, compared with 20 days for unexposed mice, according to the study published in the journal Reproductive Toxicology. The quat-exposed mice also gave birth to significantly fewer pups over the study period, and they experienced more spontaneous abortions and fetal distress. Four of the ten exposed females died during the late stages of pregnancy due to difficult labor.

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“The results suggest that quaternary ammonium compounds affect both the maternal ability to achieve and sustain pregnancy and the developing fetus,” wrote the researchers.

The mice were exposed to a “moderate dose” of the chemicals, according to Dr. Terry Hrubec, lead study author and veterinary researcher at Virginia Tech. The dose was half the size that previously had been shown to induce signs of toxicity in mice.

Mice were fed the quats, but it’s not known what the primary route of exposure would be for people. It’s likely, Hunt said, that people would be exposed in a number of ways, including ingesting them and inhaling them.

No one has measured people’s exposure to quats. Hunt said it’s an important question for future studies to address, particularly for women who work at healthcare or food production facilities.

Information on the toxicity of quats has been limited to unpublished industry reports, which indicated that the main effect of exposure to a single compound is weight reduction. The new study instead examined a common mixture. “We shampoo our hair, slather our bodies, eat in restaurants. In real life, we’re not exposed to chemicals in isolation,” Hunt said.

The ability to kill a broad spectrum of pathogens makes quats effective cleaning agents, said Paul DeLeo, an associate vice president at the American Cleaning Institute, which represents cleaning products companies. “These chemicals are essential for keeping hospitals sanitary and reducing infections. Hospital-acquired infections kill more people than some cancers.”

But the proliferation of antimicrobial hand sanitizers and other personal and household products raises questions about the use of these chemicals in everyday life, the researchers said.

Some companies offer devices that aerosolize quat cleaners to rid the air of germs. “We’ve become really germ-conscious. We try to prevent ourselves and our kids from getting the flu, getting infections. This raises concerns about the cost of those efforts,” Hunt said.

Hunt and Hrubec came upon the finding unexpectedly. Both observed breeding problems in research mice at their separate facilities after changing to disinfectant products containing the quat combination. Hunt **determined** that quat residues in the caging materials contributed to breeding failures and poor pregnancy outcomes.

For Hunt, the experience was a bit of déjà vu: In 1999, she discovered what was then a little-known chemical, bisphenol A, in water bottles mimicked estrogen and disrupted hormone levels in her lab mice. The finding helped spur investigation of the health risks associated with BPA.

Hunt said both incidents illustrate a problem with the way that new and existing chemicals are regulated in the U.S. Thousands of products have entered the market in the past few decades with little information on potential health impacts, she said. “The onus is really on consumers to determine which products are safe. That’s not OK.”

But industry representatives say the chemicals in their products are regulated and adequately tested.

“All of our products undergo rigorous safety testing that meets with local, state and federal regulations. Our registered disinfectant products are regulated by the U.S. EPA,” said Rita Gorenberg, a spokesperson for Clorox. Some Clorox products, including disinfecting wipes contain quats.

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Quats are now on the radar of environmental scientists, too. Their ability to stick around on surfaces makes them effective disinfectants but also creates concern about their ability to accumulate in the environment, said Marty Mulvihill, director of the University of California, Berkeley's Center for Green Chemistry.

It's hard to find chemicals that can perform the same function as quats, Mulvihill said. They are among the few preservatives that can function with the alkalinity needed for many cleaning products.

"There aren't currently a lot of great options out there. In order to protect ourselves and the environment, it's important to develop a wide range of greener alternatives," he said.

It can be hard to tell which products contain quats. The information is seldom available on ingredient labels, but sometimes can be tracked down on product websites. Commercial-grade cleaning products tend to have a much higher concentration of quats than cleaners and personal care products sold for household use.

"The best thing women can do is to be aware of a variety of exposures in personal care and household products and to go to reliable sources of information that vet the available science in an objective way," said Giudice, who pointed to UCSF's Program on Reproductive Health and the Environment as an [example](#).

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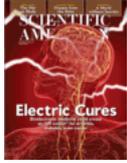
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