

Big health risk seen in some laser printers

Jane Kay, Chronicle Environment Writer

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If you work near certain models of laser printers, you might be breathing the same amount of ultra-fine particle pollution as if a smoker were puffing away in the next cubicle, according to a study by Australian scientists.

In one of the first studies of laser printers in a work setting, researchers found that some models are sources of ultra-fine particles that contribute to indoor air pollution. Breathing tiny particles can cause respiratory irritation and more severe illnesses such as heart disease and cancer.

Almost half of the laser printers tested in the study emitted tiny particles of toner-like material, sending out concentrations ranging from low to high, according to the study findings published online today for the American Chemical Society's journal *Environmental Science and Technology*.

The worst printers released amounts of ultra-fine particles rivaling plumes of secondhand smoke. When inhaled, the particles - tiny flecks between 100 and 1,000 times smaller than the thickness of a human hair - can work their way deep into the lungs, leading to heart and lung disease, scientists say.

Laser printers in the study were manufactured by Hewlett-Packard, Toshiba, Ricoh and Canon. All use toner, a powder used instead of ink.

Neither the state nor federal governments regulate indoor air pollution, even though most people spend about 90 percent of their lives inside buildings.

"If a printer operates in an indoor environment, the concentration of ultra-fine particles would be of the same order of magnitude as if there was secondhand smoke in a similar environment," said author Lidia Morawska, director of the International Laboratory for Air Quality and Health at Queensland University of Technology in an interview from Brisbane.

"Even very small concentrations can be related to health hazards," she said. "Where the concentrations are significantly elevated means there is potentially a considerable hazard."

A worker's exposure level depends on the effectiveness of the building's ventilation. The study also found that during work hours, printer use caused indoor air pollution to increase fivefold.

Study results imply that "concentration levels in an office can be reduced by a proper choice of printers," Morawska said.

Some printer manufacturers responded that their products meet safety and health requirements. HP officials, for example, said they are reviewing the study and have been conducting their own tests.

Morawska worked with fellow study authors, university colleague Congrong He and Len Taplin of the Queensland Department of Public Works. The department partially financed the study.

The researchers first went into a six-story office building in Brisbane with the intent of testing the efficacy of the ventilation system. They measured emissions from office equipment and found that the laser printers put out the most ultra-fine particles.

The building had 62 laser printers. Of 42 different models found, 34 models were manufactured by HP, five by Ricoh, two by Toshiba and one by Canon.

After testing all of the printers at a distance of about 2 feet, the researchers divided them into four different categories. Twenty-three models fell in the non-emitter category, four in the low category, two in the medium category and thirteen in the high category.

The results were verified by tests repeated in a special laboratory chamber. The researchers tested one machine in each of the emissions categories, Morawska said.

"In the chamber, we were able to look at the effect of the toner and see whether the age of the cartridge made a difference. Emissions were higher with a newer cartridge and when there was a greater density of toner coverage," she said.

For almost two years, HP has been working with scientists to study emissions from laser printers, company spokeswoman Emily Horn wrote in an e-mail to The Chronicle. To date, HP hasn't been able to determine the chemical composition of the ultra-fine particles, nor has it been able to trace the source in the printing system, she said.

"HP believes that all laser printers emit nanoparticles to one degree or another," Horn wrote. Emissions come from a variety of sources in the printer, and while the number of particles emitted is high, they're so tiny that it's difficult to collect a sample large enough to analyze, she wrote.

Past studies have shown that photocopy machines also release tiny particles. But in the Brisbane office building, the researchers found that the copiers were not nearly as problematic as the laser printers, Morawska said.

Other studies that have focused on office air pollution have shown that the pollutant ozone - which can come into buildings from the outdoors or be created by machines like printers or copiers - can mix in the air with organic substances, such as solvents in air fresheners or floor cleaners. That mixture can create new kinds of indoor particles, such as a formaldehyde-like chemical that enters the lungs when inhaled.

The Australian study didn't look at whether ozone contributed to the particle emissions. HP believes that the issue of ozone is largely of the past because of technological changes in the printers that cause them not to emit the pollutant.

Scientists need to do more study on the human health effects of ultra-fine particles from office equipment,

said Charles J. Weschler, an indoor air pollution expert and professor at Robert Wood Johnson Medical School and Rutgers University.

Only a few studies focus on the health effects of indoor air pollution while damage caused by ultra-fine particles out of doors is well understood, he said.

"We still have a great deal to learn regarding the consequences of indoor inhalation and ultra-fine particles," Weschler said.

At the Lawrence Berkeley National Laboratory, environmental chemists Hugo Destailats and Randy Maddalena praised the Australian paper and said it pointed toward areas where future studies are needed. The two scientists are examining how the chemical particles are produced from laser printers and computers and what the particles are made of. They, too, said they don't yet know the chemical composition of the toner-like material.

Russell Marchetta, a spokesman for Ricoh Americas Corp., which has main offices in West Caldwell, N.J., said his company is pleased that out of five printers, four showed no emissions and one showed low emissions. Toshiba executives did not return calls seeking comment.

Online resources

Read the study:

www.sfgate.com/ZND

Printer pollution

Printer pollution

Printer tests showed levels of ultra-fine particle pollution:

High-level emitters

HP Color LaserJet 4650dn

HP Color LaserJet 5550dtn

HP Color LaserJet 8550N

HP LaserJet 1320N

HP LaserJet 1320n

HP LaserJet 2420dn

*HP LaserJet 4200dtn

HP LaserJet 4250n (old cartridge)

HP LaserJet 4250n (new cartridge)

HP LaserJet 5(a) (further study needed)

*HP LaserJet 8000DN

HP LaserJet 8150N

Toshiba Studio 450

Mid-level emitters

HP LaserJet 1020

HP LaserJet 4200dtn

Low-level emitters

Canon IRC6800

HP LaserJet 5M

HP LaserJet 9000dn

Ricoh CL3000DN

Non-emitters

HP Color LaserJet 4550DN

HP Color LaserJet 8500DN

HP LaserJet 2200DN

HP LaserJet 2300dtn

HP LaserJet 4 plus

HP LaserJet 4000N

HP LaserJet 4000TN

HP LaserJet 4050N

HP LaserJet 4050TN

HP LaserJet 4si

HP LaserJet 5(b) (further study needed)

HP LaserJet 5000n

HP LaserJet 5100tn

HP LaserJet 5N

HP LaserJet 5si

HP LaserJet 5si/NX

HP LaserJet 8000DN

HP LaserJet 8150DN

Ricoh Aficio 2022

Ricoh Aficio 3045

Ricoh Aficio 3245C

Ricoh Aficio CC3000DN

Toshiba Studio 350

*possible high emitter

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E-mail Jane Kay at jkay@sfchronicle.com.

<http://sfgate.com/cgi-bin/article.cgi?f=/c/a/2007/08/01/MNFBRAN0J2.DTL>

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