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Is Your Printer Polluting the Air You Breathe?

Could be. A new study shows some laser printers emit potentially harmful particulate matter

You know about choking, toxic emissions from cars, cigarettes and coal-burning plants. But did it ever occur to you that your handy dandy printer might be a source of lung-damaging pollutants?

Be advised: researchers from the Queensland University of Technology in Brisbane, Australia, have discovered that certain laser printers emit high concentrations of tiny particles into the air. "People could be exposed to dangerous levels of ultrafine particles emitted by printers if they are in an environment that is poorly ventilated and the printer operation is frequent or continuous," says Lidia Morawska, a physicist and co-author of the study, which appears in this month's online issue of the American Chemical Society's *Environmental Science & Technology*.

Morawska and her colleagues spent 48 hours continuously monitoring the particle concentration

 Yes No Yes No Yes No

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of air inside and outside an office space in an air-conditioned, well ventilated, nonsmoking building in downtown Brisbane. Air-monitoring devices were placed both in the center of the fourth-floor, open-plan office space, at least four meters away from any printers as well as outside the space on the same floor. They found that the particle concentration inside the office area was five times higher during working hours when people were using office equipment than it was during off hours. They also discovered that the concentration of particles was higher inside than outside the office during prime working hours. The main source of those minute particles, which are dangerous because they are tiny enough to penetrate the airways and blood, potentially causing or exacerbating respiratory and cardiovascular conditions: laser printers.

When the researchers investigated emissions from all 62 printers in the entire six-story building, they found that 25 of them (40 percent) were emitting particles. Among those, 17 (27 percent) were "high emitters" (including HP LaserJet and HP Color LaserJet models, and one Toshiba Studio model), which caused the concentration of particles in the surrounding air to jump tenfold when just one page was printed. The majority of particles were ultrafine, or less than 0.1

micrometer in diameter.

"Because these particles are so small, there is a very high probability for these particles to deposit in the deepest alveoli in the lung...; from there they can enter the bloodstream," Morawska says. This could cause changes in blood properties that lead to cardiovascular disease, she notes. If the particles contain cancer-causing agents, exposure could also increase the risk of cancer, but Morawska says researchers did not test the chemical composition of the particles. The primary purpose of this study was to determine the concentration of ultrafine particles emitted by laser printers.

The scientists suspect that the toner is to blame, noting that emissions were higher when toner cartridges were full and when printing jobs required large amounts of it.

"It's certainly a concern," says Mark Mendell, an epidemiologist from Lawrence Berkeley National Laboratory in California. "The smaller [the particle] the worse, [and] the more likely they are to get deep into the lungs and possibly into the bloodstream." But showing that printers produce pollutants "is not the same thing as knowing that it causes certain health effects," he says.

Thomas McKone, professor of Public Health at the University of California, Berkeley, says it is good to be aware of the potential danger but that consumers should not fret too much—at least not yet. "Fine particles alone are not enough to worry about," he says, pointing to other potential indoor sources of ultrafine particles, including home cooking, candles and fires.

"There are definitely more studies that need to be done," most notably to determine the composition of the particles being emitted, Morawska says. After that information becomes available, scientists will be able to, if necessary, advise manufacturers on ways to design safer printers, she adds.

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