# Study reveals mercury levels in downtown Toronto

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Professor Julia Lu, seen here, is supervisor and one of eight authors of a recent study on elemental mercury levels in Toronto.

Buildings are not only an intrinsic part of Toronto's landscape, they are also adding mercury to the city's air. As suggested by the findings of a Ryerson University study, it can lead to a negative long-term impact on our health.

“Indoor air has higher mercury concentration than outdoor air,” says chemistry and biology professor Julia Lu, supervisor of the research team and one of the authors of the study. “As a result, mercury has been reduced or removed from some products that are used indoors, but more

steps need to be taken."

Elemental mercury, a highly toxic substance found in such things as thermometers, batteries and fluorescent lights is liquid at room temperature. If it is not sealed in a container it can evaporate and be carried into the atmosphere. Eventually, it becomes oxidized mercury, which clings to surfaces in the environment. It will also change from inorganic forms to organic forms, which are much more toxic and will accumulate in the food chain.

To measure gaseous elemental mercury (GEM) in the atmosphere in Toronto, the researchers analyzed GEM concentrations at different times of day along major streets and highways, such as Queen Street, Eglinton Avenue, Highway 7 and Steeles Avenue. Twenty-seven underground and surface parking lots throughout the downtown core were also tested, as were five locations within and around Ryerson University's Kerr Hall.

The researchers made several discoveries. First, they found that in Toronto, the higher the elevation, the higher the level of atmospheric GEM. Second, GEM levels are higher in underground parking lots than in surface lots. Third, GEM levels are higher indoors than outdoors. Fourth, GEM levels are higher in the outside air near building walls. Fifth, GEM levels at pedestrian levels during rush hour and non-rush hour were not statistically different from each other. The final finding, according to Lu, indicates that vehicles are not a major source of mercury to the urban atmosphere.

"There's no need for alarm among pedestrians because street-level concentrations of elemental mercury aren't high compared to rural areas. It won't make you sick right away," Lu says.

The real danger, she continues, is the future impact of mercury on the planet. Through a process combining long-range transport, chemical

conversion, and bio-accumulation, mercury builds up in living organisms and ultimately affects every level of the food chain. This situation poses a serious threat to human and animal life, and the environment. A common example of bio-accumulation is the high levels of mercury in fish and shellfish. Consumption of such fish during pregnancy can pose significant health problems for babies.

More studies are needed to estimate the contribution of urban areas to atmospheric mercury, and the impact of indoor air on outdoor air quality and human health. In the meantime, though, Lu says it's important to take some action now.

"Mercury can be discovered during building renovations. For example, it can be found in the floor tiles of an industrial building that used mercury or after a mercury spill in an old laboratory. It can be difficult to retrieve. So, our starting point is to get the source of the mercury under control and then reduce indoor levels of it."

Lu and her team continue to research the presence and impact of elemental mercury, their next objective will be to pinpoint and quantify buildings that are sources of elemental mercury.

The paper's lead authors are former Ryerson graduate student Elaine Cairns and undergraduate student Kavitharan Tharumakulasingam (a NSERC Undergraduate Student Research Awards recipient), both of whom were supervised by Lu. The research team also included Lu's former graduate students Irene Cheng and Y. Huang, current graduate student Muhammad Yousaf, Dave Yap of the Ontario Ministry of the Environment and Makshoof Athar, a postdoctoral fellow from the University of the Punjab.

"Source, concentration, and distribution of elemental mercury in the atmosphere in Toronto, Canada" was published earlier this year in the

online version of the journal *Environmental Pollution*. Research funding was provided by the Ontario Ministry of the Environment, the Natural Sciences and Engineering Research Council of Canada, and the Canada Foundation for Innovation. Support for Athar's work was provided by the Higher Education Commission of Pakistan.

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