

Summer is here and the mercury is rising... literally

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Ryerson University researcher Julia Lu investigates forms of trace metals in the environment, especially mercury. Her latest study finds that higher levels of atmospheric mercury exist in urban areas as compared to rural regions, and that summer is the peak season for mercury, with highest levels being reached in June.

Hot town, summer in the city. When it comes to air-quality advisories, city residents are no strangers, especially during the dog days of summer. But smog is made up of an array of air pollutants, including the mad hatter's muse, mercury. One Ryerson University researcher has found that summer is the peak season for this atmospheric toxin, and that higher levels of mercury species exist in the urban atmosphere as compared to rural regions.

Julia Lu is an Associate Professor in Ryerson's Department of Chemistry and Biology, where she conducts research identifying and quantifying different forms of trace metals in the environment. Her main focus, however, is mercury, an element that can be found in many places, which explains why Dr. Lu's work has involved such diverse locales as the Canadian [Arctic](#) and, more recently, Toronto, Canada's largest city.

One of many contributing poor air factors, mercury is well-known for its toxic effects on the environment and human health. Airborne mercury's greatest threat is that it will settle into the surface environment and be converted into the much more toxic organomercury species which can be accumulated and magnified up the food chain, reaching our dinner table through fish and shellfish consumption.

Mercury measurements in the urban atmosphere have been very limited in contrast to rural and remote areas. So, in order to investigate this particular field, Dr. Lu and her then-graduate students Xinjie Song and Irene Cheng mounted specialized equipment - including air sampling units and a meteorological station - atop a three-storey building on Ryerson's campus in downtown Toronto. From there, the team simultaneously measured three types of mercury: atmospheric gaseous elemental mercury (GEM), reactive gaseous mercury (RGM) and mercury associated with particles with sizes less than 2.5 micrometres.

In addition to finding higher mercury levels in urban areas, the team discovered those levels seemed to be affected by human-produced emissions, rather than chemical and photochemical reactions in the environment. Finally, while the concentrations of all mercury species varied during the year - and were lower in the winter - the amount of GEM spiked in June. A concern, according to Dr. Lu, because GEM stays in the atmosphere longer and travels further than its chemical counterparts. The result, she believes, is a global-scale problem.

“Sometimes the spikes were as high as what you would find near point sources of mercury,” says Dr. Lu, citing coal-powered and metal-processing plants as examples. “We need to further our understanding of how cities contribute to the mercury problem. And it’s not just GEM that requires attention. Other forms of mercury stay in the atmosphere for a shorter duration and therefore negatively impact local and regional areas.”

As next steps, Dr. Lu is working to pinpoint sources of mercury in the urban environment. To help accomplish her objective, Dr. Lu has moved her measurement equipment to the top of a taller building on campus and has outfitted a car that will drive around and measure mercury at street-level. At the same time, a group of more than 10 Ryerson researchers are developing a weather network that is trying to figure out air-flow patterns in the city, which will also benefit Dr. Lu’s research.

The goal of the initiatives is simple, Dr. Lu says: to positively influence population health.

Annual Atmospheric [Mercury](#) Species in Downtown Toronto, Canada appeared in a recent edition of the *Journal of Environmental Monitoring*.

Source: Ryerson University

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