

Swimming pool urine combines with chlorine to pose health risks

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Credit: Wikipedia.

A new study shows how uric acid in urine generates potentially hazardous "volatile disinfection byproducts" in swimming pools by interacting with chlorine, and researchers are advising swimmers to observe "improved hygiene habits." Chlorination is used primarily to prevent pathogenic microorganisms from growing. The disinfection

byproducts include cyanogen chloride (CNCl) and trichloramine (NCl₃). Cyanogen chloride is a toxic compound that affects many organs, including the lungs, heart and central nervous system by inhalation. Trichloramine has been associated with acute lung injury in accidental, occupational or recreational exposures to chlorine-based disinfectants.

Researchers had already known that certain airborne contaminants are created when chlorine reacts with sweat and urine in indoor [swimming pools](#). The new findings show definitively that [uric acid](#) from urine is "an efficient precursor to the formation of CNCl and NCl₃," said Jing Li, a visiting scholar from the China Agricultural University working at Purdue University with Ernest R. Blatchley III, a professor of civil engineering.

"Given that uric acid introduction to pools is attributable to urination, the findings indicate important benefits to pool water and air chemistry that could result from improved hygiene habits on the part of swimmers," Blatchley said. "A common misconception within the swimming community is that urination in pools is an acceptable practice, although signs and placards are posted in many pools to encourage proper hygiene. It is also well known that many swimmers ignore these warnings, particularly noteworthy among these are competitive swimmers."

The findings are detailed in a research paper that appeared in February in the journal *Environmental Science & Technology*. The paper was authored by Blatchley and China Agricultural University researchers Lushi Lian, Yue E and Li.

The Centers for Disease Control and Prevention has documented cases in which people became ill after breathing contaminants at improperly maintained indoor swimming pools. Of particular concern are nitrogen-containing [disinfection byproducts](#), which are more likely than other

byproducts to be carcinogenic and to cause cell damage.

The new findings suggest more than 90 percent of uric acid introduced to pools comes from human urine. The researchers analyzed swimming pool water samples, combined with the results of experiments involving chlorination of uric acid and body-fluidlike mixtures. The Purdue researchers used an analytical technique called membrane introduction mass spectrometry to identify and measure the volatile disinfection byproducts.

More information: "Volatile Disinfection Byproducts Resulting from Chlorination of Uric Acid: Implications for Swimming Pools" *Environ. Sci. Technol.*, 2014, 48 (6), pp 3210–3217. [DOI: 10.1021/es405402r](https://doi.org/10.1021/es405402r)

Provided by Purdue University

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