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Swine Flu: Influenza A (H1N1) Susceptibility Linked to Common Levels of Arsenic Exposure

The ability to mount an immune response to influenza A (H1N1) infection is significantly compromised by a low level of arsenic exposure that commonly occurs through drinking contaminated well water, scientists at the Marine Biological Laboratory (MBL) and Dartmouth Medical School have found. Their findings are reported in the journal *Environmental Health Perspectives*.

"When a normal person or mouse is infected with the flu, they immediately develop an immune response," says Joshua Hamilton, the MBL's Chief Academic and Scientific Officer, in which immune cells rush to the lungs and produce chemicals that help fight the infection. However, in mice that had ingested 100 ppb (parts per billion) arsenic in their drinking water for five weeks, the immune response to H1N1 infection was initially feeble, and when a response finally did kick in days later, it was "too robust and too late," Hamilton says. "There was a massive infiltration of immune cells to the lungs and a massive inflammatory response, which led to bleeding and damage in the lung." Morbidity over the course of the infection was significantly higher for the arsenic-exposed animals than the normal animals.

Respiratory infections with influenza A virus are a worldwide health concern and are responsible for 36,000 deaths annually. The recent outbreak of the influenza A H1N1 substrain ("swine flu"), which is the same virus that Hamilton and his colleagues used in their arsenic study to date has killed 72 people in Mexico and 6 in the United States.

"One thing that did strike us, when we heard about the recent H1N1 outbreak, is Mexico has large areas of very high arsenic in their well water, including the areas where the flu first cropped up. We don't know that the Mexicans who got the flu were drinking high levels of arsenic, but it's an intriguing notion that this may have contributed," Hamilton says.

The U.S. Environmental Protection Agency considers 10 ppb arsenic in drinking water "safe," yet concentrations of 100 ppb and higher are commonly found in well water in regions where arsenic is geologically abundant, including upper New England (Massachusetts, New Hampshire, Maine), Florida, and large parts of the Upper Midwest, the Southwest, and the Rocky Mountains, Hamilton says.

Arsenic does not accumulate in the body over a lifetime, as do other toxic metals such as lead, cadmium, and mercury. "Arsenic goes right through us like table salt," Hamilton says. "We believe for arsenic to have health consequences, it requires exposure day after day, year after year, such as through drinking water."

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