

Scientist on mission to improve global water safety makes groundbreaking discovery

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A study led by the University of Bristol shedding new light on how arsenic can be made less dangerous to humans has the potential to dramatically improve water and food safety, especially in the Global South.

It's an academic and personal mission for the lead researcher because he witnessed first-hand the constant struggle to find clean, arsenic-free water as a child in India.

Lead author Dr Jagannath Biswakarma, Senior Research Associate at the University's School of Earth Sciences, said: "Millions of people live in regions affected by arsenic, like I was growing up. This breakthrough could pave the way for safer drinking water and a healthier future."

Arsenic pollution exposure is a huge environmental and public health issue in southern and central Asia and South America, where people depend on groundwater for drinking and farming. The more toxic and mobile form of arsenic, called arsenite, easily seeps into water supplies and can lead to cancers, heart disease and other serious conditions.

Dr Biswakarma said: "I've seen the daily battle for safe drinking water in my hometown Assam. It's very hard to find groundwater sources that aren't contaminated with arsenic, so for me, this research hits close to home. It's an opportunity to advance science and better understand the extent of a problem which has affected so many people in my community and across the world for many decades."

Scientists previously believed arsenite could only be turned into the less harmful form, called arsenate, with oxygen. But this new study has shown it can still be oxidised, even in the absence of oxygen, with small amounts of iron which act as a catalyst for oxidation.

Dr Biswakarma said: “This study presents a new approach to addressing one of the world's most persistent environmental health crises by showing that naturally occurring iron minerals can help oxidise, lowering the mobility of arsenic, even in low-oxygen conditions.”

Study findings revealed that arsenite could be oxidised by green rust sulfate, a source of iron prevalent in low-oxygen conditions, such as groundwater supplies. They also showed that this oxidation process is further enhanced by chemicals released by plants and commonly found in soils and groundwater.

“These organic ligands, such as citrate from plant roots, could play a critical role in controlling arsenic mobility and toxicity in natural environments,” Dr Biswakarma added.

The implications of this discovery are particularly significant for regions in the Global South facing some of the world's highest levels of arsenic pollution. In countries such as India and Bangladesh, the local geology is rich in iron, and reducing conditions often dominate groundwater systems, leading to high levels of arsenic contamination. In the Ganges-Brahmaputra-Meghna Delta, which spans Bangladesh and eastern India, millions of people have been exposed to arsenic-contaminated groundwater for decades as the chemical enters the water through natural processes.