

CITIES CASE STUDY

Increasing understanding and awareness of arsenic exposure

The background

Water is one of our most important natural resources.

In many parts of the world, groundwater containing arsenic is used for drinking, cooking and irrigating crops. Continued exposure to high levels of arsenic is a major health risk that leads to cancer, ischaemic heart disease and compromises the immune system.

To address the risks posed by arsenic-contaminated groundwater, we need to understand how arsenic enters water sources, assess the risk it poses and raise public awareness of those risks.

At The University of Manchester, we have a unique culture of collaboration and specialist expertise that means we are well-positioned to address these issues. With funding from the Natural Environment Research Council (NERC) and the Engineering and Physical Sciences Research Council (EPSRC), we brought together geochemists and microbiologists to better understand the origins and extent of this problem.

We're exploring the origins and impact of arsenic in groundwater, public water supplies and food.

10,000

In Bangladesh, tens of thousands die prematurely each year due to chronic arsenic exposure.

Arsenic in groundwater

The challenge

In order to predict arsenic concentrations and inform remediation, we need to understand how arsenic enters well water.

The research

Our researchers examined treated, carefully-sourced sediment samples in Cambodia to explore the factors affecting arsenic release from sediment into groundwater. They discovered that indigenous bacteria are critical to the processes that drive the transfer of arsenic into groundwater, representing a significant health risk to those drinking or cooking with contaminated water.

The benefits

For our local partner...

Resource Development International, an American NGO, used our predictive groundwater arsenic hazard maps to help advise Cambodians on alternative water sources for populations affected.

For The University of Manchester...

Our researchers were the first to publish ground-breaking research on the arsenic hazard in Cambodian groundwater, and were able to use this information to develop predictive groundwater arsenic hazard maps.

For society...

Our novel findings are informing how policy makers worldwide consider future regulations, and have initiated work into the use of specific bioremediation technologies to reverse processes of arsenic transfer.

We're informing current thinking and future regulations.

Arsenic in rice

The challenge

People can be exposed to arsenic by eating rice from fields irrigated with contaminated water. To understand the risk this poses, the extent of arsenic exposure through consumption of rice must be determined.

The research

In Bengal, our researchers analysed arsenic concentrations in local rice and average levels of consumption, and discovered that in affected areas rice is a major arsenic exposure route for humans.

In these areas, the extent of the problem is such that the calculated lifetime cancer risk for people consuming rice as a staple food with typical arsenic levels exceeds the risk from drinking water with arsenic levels at the provisional guide value.

The benefits

For The University of Manchester...

The opportunity to collaborate and conduct novel research that has a direct impact at many levels.

For society...

Increasing awareness of the importance of rice as a significant arsenic exposure route. This is reflected in changes to Food & Agricultural Organisation (FAO) recommendations on provisional weekly tolerable intake, and acknowledgement of the importance of rice as a significant exposure route by the European Food Safety Authority (EFSA).

We're raising international public awareness.

Arsenic risk in the UK

The challenge

Over 5% of private water supplies tested in a trial area of South West England contain arsenic at levels higher than the World Health Organisation provisional guide value and the UK regulatory limit. Further work is needed to investigate the risk that arsenic poses to UK citizens.

The solution

The University of Manchester has formed a collaborative partnership with the British Geological Survey (BGS) and Public Health England (PHE) to explore arsenic risk in the UK, focusing on private water supplies, funded by the Natural Environment Research Council.

This partnership builds on previous work conducted by the BGS in the UK, and international research conducted by The University in Manchester in Bengal and Cambodia, to assess the risk that arsenic exposure poses to citizens in the UK.

The benefits

For Public Health England...

Knowledge and information about arsenic exposure through various routes and for different risk groups in the UK, and access to national and international partners.

For The University of Manchester...

Strengthened partnerships with various agencies, including Public Health England, and an £4.5M funding to conduct follow-on research addressing the problem of arsenic origins and exposure.

For society...

Public recognition of the risk of arsenic exposure, informing current thinking and future regulations and policy for groundwater abstraction and irrigation.

We're combining our expertise.

Engaging with Manchester has opened doors to the many national and international partners working on this increasingly important topic, with huge added value to both the University and ourselves. Many new avenues are being explored for development into significant projects of mutual benefit.

*Dr Giovanni Leonardi,
Environmental Public Health Tracking Group,
Public Health England.*

Our work nationally and internationally is addressing the problem of arsenic exposure.



Summary

Water is one of our most important natural resources, and in many regions around the world, groundwater is used for drinking, cooking and irrigating crops.

However, in regions such as Bangladesh this groundwater is contaminated with arsenic, high concentrations of which can cause cancer, ischaemic heart disease and compromise the immune system. A diverse team of researchers from The University of Manchester discovered that it is contamination with bacteria that drives the transfer of arsenic into water, and that rice grown with this water is a major source of arsenic exposure for humans.

In the UK, private water supplies tested in a trial area of South West England contained arsenic levels exceeding the World Health Organisation provisional guide value in more than 5% of cases. To build on this existing research and explore the problem of arsenic exposure in the UK, The University of Manchester has formed a collaborative partnership with British Geological Survey and Public Health England, to further address the problem of arsenic origins and exposure.