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Lede, Water, Water management, West Bengal

This Crucial Innovation Removes Deadly Arsenic From Our Water For Just 60 Paise/Litre

Tens of millions of people daily drink water that significantly increases their risk of cancer and other deadly diseases. This must end!

by **Rinchen Norbu Wangchuk** December 12, 2018, 12:50 pm

Citing its own data, the Central Government of India earlier this year stated that millions of people in India are at risk of consuming drinking water with high arsenic content.

According to the World Health Organisation, long-term exposure to arsenic-contaminated water can result in cancer and skin lesions.

Arsenic contamination has also been linked to cardiovascular disease and restricting cognitive development and lowering of IQ in children. The problem is widespread in multiple states, especially along the Indo-Gangetic plain.

Six states are considered arsenic affected by the Central Ground Water Board – West Bengal, Jharkhand, Bihar, Uttar Pradesh, Assam, Manipur, and Chhattisgarh.

Arsenic ends up in water by the dissolution of arsenic-bearing sediments and silts into groundwater aquifers that are in contact with arsenic-bearing strata.

Arsenic is tasteless, colourless, odourless, and highly toxic. Lifelong consumption of drinking water with arsenic even at its allowed maximum contaminant level (“MCL”) of 10 ppb (parts per billion) produces far more internal cancers than those produced from the next most hazardous regulated waterborne carcinogen at its MCL.

“For illustration, lifelong consumption of water with PCBs (polychlorinated biphenyls) at their allowed MCL concentration causes 0.5 excess internal cancer per 100,000 people; arsenic causes 700. For 100,000 people drinking water, for their lifetime, at 250 ppb Arsenic level, 18,000 more people are predicted to suffer from internal cancers, compared to the baseline

case of the same population drinking arsenic-free water," says Dr. Arkadeep Kumar, a member of the Research team from the famous Lawrence Berkeley National Laboratory, in a conversation with The Better India.

A collaborative team of top-notch researchers from University of California, Berkeley, led by the famous Dr. Ashok Gadgil—the man responsible for developing low cost water disinfection system (UV Waterworks) and cooking stove (Berkeley-Darfur Stove) for the poorest citizens of the world, and Global Change Programme of Jadavpur University led by Prof. Joyashree Roy, Indian Council of Social Science Research (ICSSR) national fellow and member of Nobel Peace Prize winning panel of 2007 IPCC—have set up a very efficient and cost-effective system called Electrochemical Arsenic Remediation (ECAR) for removing arsenic contamination from drinking water.

Since 2016, this team of researchers from the two countries have operated an ECAR based water treatment plant out of a government school at Dhapdhapi village in the South 24 Parganas district of West Bengal, delivering arsenic-free drinking water.

Water distribution to students of Dhapdhapi high school.

West Bengal, particularly its three districts of North 24 Parganas, Murshidabad and South 24 Parganas, are among the worst affected in India when it comes to such contamination. The ECAR Project offers a viable solution for locals to get rid of arsenic contamination.

So, how does it work?

“ECAR works with steel electrodes immersed in the water to be treated, and a low-voltage power supply connected to them. During water treatment, rust is created. The rust oxidizes and captures arsenic, coagulates, settles, and is filtered out,” says Dr. Arkadeep Kumar, a team member of the ECAR research team.

Backed by multiple peer-reviewed scientific papers by the researchers and implementation handled by a technically proficient licensed entrepreneur, the ECAR offers locals affordable access to arsenic-safe drinking water.

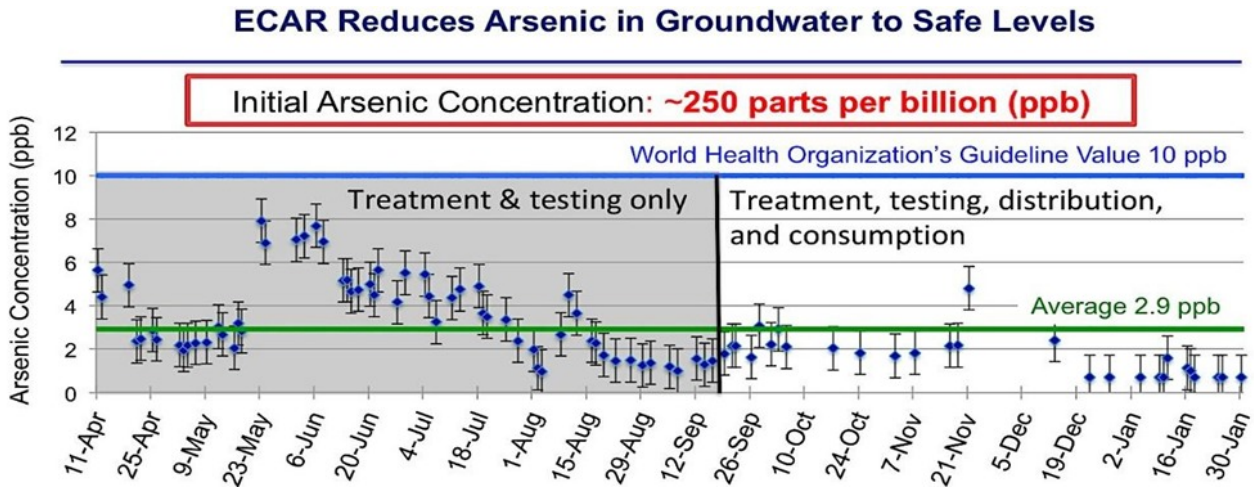
Besides undergoing multiple long-term design tests across different locations, their water is regularly under the microscope at nationally accredited water-testing laboratories, adds a researcher from Global Change Programme, Jadavpur University.

“The key components of the ECAR plant are the rust formation chamber, coagulation and settling chamber to remove settled sludge, post-treatment filtering and UV treatment to provide additional layers of protection to ensure the product-water is fit and pleasant for drinking. There is careful management of arsenic-bearing sludge so that arsenic does not re-enter the environment. Finally, the system comes with a simple distribution system,” says a team member of the ECAR project.

As per the WHO recommendations, the upper limit for arsenic in drinking water is 10 micrograms of arsenic per litre of water (10 ppb).

Arsenic removal Reactor Tank.

“We have monitored the arsenic levels in the product water at our pilot ECAR plant at Dhapdhapi all along and have found it to be consistently producing treated water with arsenic level well below the WHO guideline levels of 10 ppb. The periodic testing carried on by Global Change Programme of Jadavpur University through NABL lab also found the product water to meet India’s potable water quality standard defined by IS 10500:2012. Results from our testing of product water at UC Berkeley facility for its arsenic content are displayed in the figure below, and these are consistent with the NABL results on file with the research team,” says Dr. Ashok Gadgil.



The data starting from April 2016 to January 2017 depicting the continuous effective removal of arsenic from initial arsenic levels of 250 parts per billion (ppb) to less than 10 ppb (WHO’s maximum contaminant level MCL is 10 ppb) during both pilot and distribution phases.

Funding for the project has come from diverse sources including Lawrence Berkeley National Laboratory at University of California Berkeley, Jadavpur University, University Grants Commission of India, Indian Council of Social Science Research (ICSSR), USAID’s Higher Education Solutions Network, and Indo-US Science and Technology Forum, among others.

Professor Ashok Gadgil & Professor Joyashree Roy inspecting the reactor tank.

In constant coordination with governments at the district, panchayat, State and Central level, the project has developed over this two-year period.

The results on the ground have been pretty evident. Locals on the ground are talking about buying this water at Rs 6 per 10 litres, and seem generally satisfied with this intervention.

“We are satisfied with buying water for Rs 6 per 10 litres. We don’t use this water to cook and other activities, but just to drink. For cooking and other activities, however, we use tube well water. Yes, it may have arsenic, but we cannot afford to buy so much water. The family will need to spend at least Rs 600 per month to buy water just for cooking,” says one tea stall owner in the village, speaking to researchers on the ground.

Professor Joyashree Roy and project team member Sreeman Mypati tasting water from ECAR plant.

However, he goes onto state that some families can afford to buy this water, while there are others who don't have the mentality to buy it for purposes like cooking.

"People come from far to buy their drinking water. They (a third-party private entity) ask us how much water we need on a monthly basis. Initially, they gave us a container of water for free, and now they take a monthly advance. The remaining money is carried forward for the next month. All these purchases happen with a card they give us like a ration card. Every family has a separate card," he adds.

"Long before starting to operate the full-scale pilot plant on a regular commercial basis with a sustainable business model, Global Change Programme of Jadavpur University took due care to make private license holder to apply for and receive from the state government bodies documents providing the Consent to Establish (COE) and Consent to Operate (COO) for the licensed private entrepreneur at the plant," says Prof. Joyashree Roy, speaking to The Better India.

Concerns do remain over the cost of water, but the price is way below Rs 10/ litre for any bottled water in the market and that's the price average consumers will have to pay to drink arsenic-safe water and prevent health consequences from arsenic.

Arsenic removal Tube Settler.

However, this price should be offset by lower medical bills with arsenic out of the water. Moreover, the University of California, which owns the patent rights to ECAR, has made the license to ECAR non-exclusive.

This means multiple entrepreneurs can license the technology and set up and operate as many ECAR plants as they like, and operate them commercially. Further, innovations on the ECAR technology, and healthy competition among licensees of ECAR technology, could also assist the process of lowering the cost.

Students from Dhapdhapi High School taking arsenic free water using her electronic card.

“We hope that this enables fast penetration through multiple efforts to accelerate the solution especially before the 2030 deadline for meeting SDGs (Sustainable Development Goals), which include safe drinking water access as a desirable target to be achieved,” adds ECAR team correspondent Dr Arkadeep.

These are the solutions we need to access clean drinking water better. There cannot be any compromise with regards to safe drinking water. This is our health we’re talking about.

(Edited by Vinayak Hegde)

(Update: The headline of an earlier version of this article had stated that the cost of water was Rs 3/Litre. It has been updated to 60 Paise/Litre. The error is regretted.)