



A SOCIETY FOR RESEARCH, AWARENESS & SOCIAL DEVELOPMENT

NEWSLETTER

Volume 1, Issue 1, October - December 2018

ARTICLE ARE INVITED FOR THE

INTERNATIONAL JOURNAL OF ENVIRONMENT AND HEALTH SCIENCES

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DRDO Domestic Filter : A Solution for Arsenic Poisoning

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Background:

One of the worst example of the ground water pollution which is also known as the biggest calamity of the century is Arsenic poisoning of ground water.

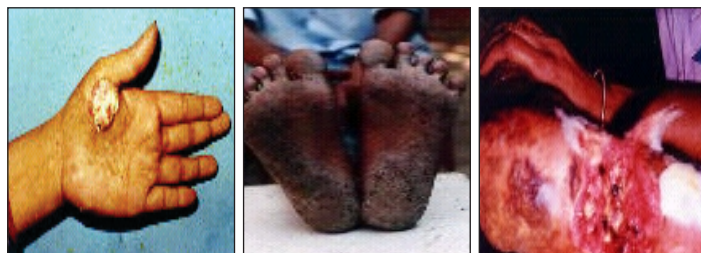
Arsenic poisoning was first reported in India during 1978 in West Bengal, since then it has been in more areas since early 90's. According to a study about 2 million of the population of W. Bengal, is drinking arsenic contaminated water and about 50,000,000 people are suffering from arsenic related diseases. Unfortunately there is neither serious investigations on sources and distribution nor management program to combat this serious problem.

Long term exposure to arsenic in drinking water are known to pose a variety of health problems including several types of cancer, cardiovascular disease, diabetes, and neurological effects. The common valances of arsenic in raw water sources are +3 (arsenite) and +5 (arsenate). In anthropogenic polluted waters, other arsenic species are to be expected. The health effects of arsenic has been reviewed by many authors and it is claimed that the toxicity of arsenic varies with the nature of chemical species in the following order:

The lethal dose for humans is estimated to be 1 to 4 mg of arsenic per kg of body weight.

Arsenic can cause acute and chronic toxicity on human health. The severity of toxicity depends on age and sex of the individual, the dose and duration of exposure, chemical nature of the compound, route of entry and the amount of arsenic accumulated into the body. The predominant symptoms of arsenic poisoning are skin manifestations which is called Arsenicosis. Other most common manifestations of arsenic poisoning are Melanosis, Keratosis, Leukomelanosis, Hyperkeratosis and also in some cases Conjunctivitis, Bronchitis and Hepatomegally. Severe cases of skin cancer (Squamous cell Carcinoma and basal cell carcinoma) have also been reported. Figures below show some of the worst cases of arsenic suffering patients.

Arsenic lesions on hands and feet



Considering the rate at which this poison is spreading its web all over the world, there is an urgent need to provide :

The youngest sufferer yet 18 months (Baby Jamil)

1. Immediate relief to those using drinking water with high arsenic concentration
2. Develop ways and means to mitigate this problem by reducing the level of arsenic in drinking water to at least the permissible and tolerable limits through easy and inexpensive means.
3. Develop and implement a long-term solution based on the scientific assessment of the contributing factors, geographic spread, and selection of treatment technologies.

DRDO Water Filter Technology - A Solution:

An innovative domestic arsenic removal water filter developed by Defence Research and Development Organization (DRDO), Ministry of Defence, Government of India has been proved to be an immediate and also a sustainable solution for the menace caused by arsenic poisoning in the various states of India (Bihar, Chattisgarh, North-East region, Uttar Pradesh and West Bengal etc.) as well as in the other developing countries such as Bangladesh, Nepal and Pakistan etc.

The technology was successfully evaluated in the field in terms of it's efficiency for the removal of arsenic, iron and bacteria from ground water. Filter works on the simple principle of co-precipitation and adsorption followed by filtration through treated sand. The technology utilizes a processed waste of Steel Industry which is abundantly available globally at a very low cost. DRDO has transferred the Technology to a very genuine NGO 'Save The Environment, based in Kolkata for the implementation and commercialization (www. Stenvironment.com). More than 5000 such filters are already in use by villagers in arsenic affected areas of some selected villages of Bihar, Tripura, Uttar Pradesh and West Bengal states of India for last ten years with the help of funding mainly provided by Department of Science and Technology.

All the selected villages have access only to ground water for the drinking and other related purposes. The initial arsenic concentration in the ground water of these villages is found to be in the range of 30 to 1000ppb except in a few cases where it has even gone up to 3000ppb as against the permissible level of 10 ppb under WHO/ EPA guidelines. The average number of the families in each village ranges between 300 to 350. The monthly average quantity of water filtered from each filter is about 6000 liters (amounting to the consumption of ~200liters per day/

filter). The successful performance of filter depends primarily upon the user, who is mainly the lady of the house trained and manages very well the simple operation and maintenance of the system.

Since, disposal of arsenic laden waste is unacceptable under growing environmental regulations due to high toxicity of arsenic, the waste generated from the filter is being disposed off in the form of standard grade impermeable concrete blocks comply with EPA's TCLP (Toxicity characteristics and leaching procedure) protocol, used in construction industry resulting in no waste generation and in turn making the technology environmental friendly and green.

The filter is user friendly, very cost effective and its price ranges from Rs. 600 to 2000/- or US\$ 10.00 to 30.00 per filter depending upon the type of material used either plastic or Stainless Steel, easy to maintain and doesn't require any power supply for the operation. The predicted life of the filters is minimum ten years. Once the reactant material is

over, it can be easily replaced at a very-very reasonable cost of ~Rs.150.00 or US\$ 2.50 per filter which is actually the annual maintenance cost also. Based on the studies carried out so far, it can be concluded that this technology has certainly paved a way for mitigating the severe problem of arsenic poisoning of water in the developing world. The technology has already been scaled up to a centralized continuous plant of flow rate of ~ 100LPH capacity to cater the need at community level.

Recognitions:

Technology has been recognized by Arsenic task force and others such as Anveshan Award-2003 by IIM, Ahmedabad, Bhartiya Stree Shakti Award-2004 and DRDO Spinoff Technology Award-2007 and NRDC-social innovation award 2012 for its innovativeness and the positive health impact in the society.

Information about the technology / Filters can be obtained at the website: www.stenvironment.com



Some Examples:



Domestic Arsenic Removal filter



DRDO Filters being installed in Tiwaritola, Ballia (UP)



RASHTRIYA SWACHHTA DIVAS

As part of swachhta mission "Save the Environment" Celebrated 2nd October as Rashtriya Swachhta Divas with special emphasis on "Reduce Use of Plastic". The event was organized in "Purva Madhyamic Vidyalaya" Shliyakote, Dhari, Dist. Nainital, Uttarakhand.

The Objective of the event was to:

1. To Create awareness among students about the health and environment hazards of plastic use.

2. To motivate the students and teachers to save our environment by not using plastic in day to day life.
3. To spread awareness about the harmful effect of burning plastic and its non-biodegradable nature.

Training camp was organised for the students, teachers and local population to spread awareness about the harmful effects of plastic.

pamphlets were distributed amongst the shopkeepers and general public with a request for minimal use of plastic in day to day life.



Glimpses of past Science and Technology Fair by Awareness Programme by STE



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