

Arsenic



Knowledge and Action Network

Newsletter

Volume 3, November 2014

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Friends,

Last month's festival of Diwali and the accompanying increase in pollution levels reiterate the issue of environment quality and the accompanying health hazards. While there is a relative increase in consciousness, reflected in changed buying and celebration patterns, there is clearly a long road ahead to be traversed.

In this third volume of the Arsenic Newsletter, we look forward to the capacity of individuals and communities to take charge of their own surrounding environment and its conservation. One such example is seen in Sahibganj, Jharkhand. Communities here have been empowered with knowledge on water quality testing and analyses. They have further built on this knowledge to develop water security plans for their localities. The efforts made in Sahibganj along with some challenges they faced in this process are shared by Dr. Alok Pandey from Participatory Research in Asia (PRIA), Delhi.

Communities' perceptions of risk are to a large extent shaped by personal experiences. Having said that, the media plays a very important role in how communities perceive the risks they are exposed to. The media influences how events are understood and responded to and this role in altering and impacting community perceptions in relation to arsenic contamination is examined briefly in this volume by Prof. Arvind Susarla from University of Hyderabad.

The network through the last six months or so, has also worked towards creating spaces for people to come together so they could share and seek knowledge. First steps towards this are being taken through an Informal Discussion Series on Arsenic in Assam. The first among these discussions was organized at Tezpur University and some important points from the discussion are mentioned.

The endeavour of the newsletter through the forthcoming volumes, will be on further information sharing. This newsletter, quite like the network itself, is also a joint effort, and we welcome the readers to share your questions, comments, suggestions, stories and challenges. We hope you enjoy reading.

Editorial Team

NETWORK SPEAKS

(Events)

ASSAM ROUNDTABLE

The Arsenic Knowledge and Action Network organized a roundtable in IIT-Guwahati on 5th Sept, 2014 to act as a common platform for information and knowledge sharing among people from various forums, institutions, organizations and government bodies working on water quality issues, with focus on arsenic contamination. The aim of the roundtable was to identify a few core areas that needed immediate attention and plan interventions around them. The purpose was to arrive at an indicative plan of action for arsenic mitigation in Assam that would identify

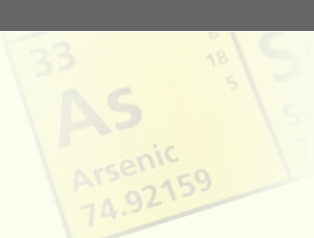
gaps in the present strategy and aim to plug them through research, knowledge curation, and action interventions. The roundtable was attended by 26 participants from 17 organizations and to a large extent, the stated objectives were achieved. A plan of action for Assam was formulated at the conclusion with activities till March 2015, details of which can be accessed here <http://saciwaters.org/AssamPoA.pdf> A detailed report of the proceedings of the roundtable can be accessed here <http://saciwaters.org/AssamRR.pdf>



INFORMAL DISCUSSION SERIES

During the last 8-10 months of engagement in Assam, the Arsenic Network has connected with a wide range of stakeholders (researchers, academicians, practitioners and administrators). Yet, there is a large pool of practitioners and researchers whom we have not been able

to reach out to. There are experts who have done distinguished work on arsenic mitigation and are repositories of large pools of knowledge on arsenic which can greatly contribute to addressing the arsenic issue in Assam, for which it should reach a wider audience.



With this thought, we are organizing a series of informal discussions through the months of October and November in Assam. The first discussion in this series was organized at Tezpur University on 15th October, 2014. It was a fruitful discussion that gave us positive outputs with the student community showing active interest in wanting to learn about the arsenic issue

and volunteer and contribute to activities aimed at mitigation.

One of the main objectives of the discussion was to discuss the arsenic issues and to understand the extent of knowledge available. A detailed proceedings report of the discussion is available at

<http://saciwaters.org/TezpurDiscussion.pdf>

SHARE SPACE

(Guest Articles)

LIVING WITH RISK

ARVIND SUSARLA

Centre for Regional Studies

University of Hyderabad

INTRODUCTION

For several decades people living in vast areas of West Bengal are drinking arsenic contaminated water¹. This is despite the fact that: the problem has been known in the public domain since about 1980; risk (as measured in injuries and deaths) has been increasing over the years; several

governmental organizations (GO) and non-governmental (NGOs) initiatives have been placed to provide for “good” quality water quality. In a few rare cases, there is anecdotal evidence that members affected by the poisoning are migrating to other places where arsenic-free water is available, but more importantly to avoid the ‘intense’ gaze of their neighbours, families, and societies at large.

Thus far, the model of decision-making of governments has been to design and place initiatives based on scientific evidence gathered from “affected sites.” Consequently, considerable effort is going into increasing awareness on the nature of problem and that they should drink and use an alternative, or more precisely, arsenic-free water². However, results of these efforts are mixed. Many people continue to drink arsenic (or fluoride) contaminated water. In paragraphs below attention is drawn to communication issues on risks, especially through mass media and in particular through print medium. These reflections are drawn from worldwide research, which indicates the relationship between mass media and risk management.

ASSESSING THE ROLE OF MASS MEDIA

The role of media in shaping public concern and responses has been extensively debated both in the mass communication research as well as in literature on the risk management. Some risk related observations include:

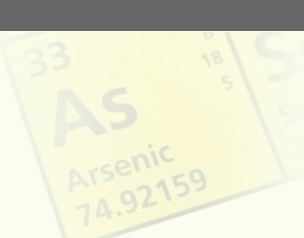
- Contrast in the extent of reporting on risks³ with magnitude of the threat involved.
- Significant discrepancies in expert and lay assessments of risks, which is inferred to be linked to the amount of media coverage.
- Similarly, researchers have established that media coverage of hazard events fails to correspond with factual data on the magnitude of the risk event.
- Close correlation between the political activity and involvement

concerning the risk to the amount of media coverage given to the subject.

RISK PERCEPTION AND MEDIA

Many research scholars have argued that public perceptions of risk are often affected by media content and coverage of risks. Research has shown that media framing of the risk event may even have a greater influence on public concern and response. It has been suggested that factors such as the sensational and dramatic nature of the event, the human interest component, and journalism constraints (such as editorial policies) rather than characteristics of an event influence level of media coverage.

In a daily coverage of risk events, issues given prominence or ignored by media can determine which risk issues receive public, political and institutional attention, and which do not. Media reporting on risk disputes suggests that a particular “frame” is adopted in selectively attending or ignoring the issues pertaining to the hazard events. The language used by different groups of people in a society to describe risk and to recommend solutions is judgmental. Furthermore, it has been shown that words imply order or chaos, others certainty and scientific precision. Through the selective use of labels one can trivialize a risk event or render it important, define an issue as a problem, or reduce it to a routine occurrence. In other words, the media play a significant role in the discourse on risk. The terms employed along with the language frame a hazard event and can influence the agenda for political attention.



IMPLICATIONS OF MEDIA'S ROLE IN RISK MANAGEMENT

Scholars have already noted how the role of mass media in a democracy is also changing—from merely mirroring what is happening in a society, to what has been hypothesized as agenda setting function of the media. Mass media itself is a business entity, and the pressures of capitalism, globalization and others have also been noted. One fertile arena that is yet to be understood well for scholars of risk is the role social media may play in exacerbating or ameliorating risk consequences.

The implication of such research work can result in better communication about risks. All reasons for disagreement could be reasoned to be due to different framing of problems, rather than irrationality. This also allows us to explore opportunities for better knowledge on how else the issues of arsenic can be thought of beside being noted as a water or public health framing, which has dominated the debate/discussion/ decision-making thus far.

USE OF GEO POSITIONING SYSTEM IN DEVELOPING WATER SECURITY PLANS

ALOK PANDEY

Participatory Research in Asia (PRIA)

New Delhi

In efforts to empower communities to ensure water security, Participatory Research in Asia (PRIA), is implementing a project entitled 'Decentralized Drinking Water Security'. This is being conducted in six arsenic affected Gram Panchayats (GPs) in Ambadiha, Damin Bhita, Mahadev Baran, Amanat Diyara, Mohanpur and Purvi Udhwa within Sahibgnaj⁴ district, Jharkhand. The focus of the project is to promote community based water management in GPs of Jharkhand so that

people can have access to safe and adequate amount of water.

A baseline survey of the region revealed several contaminated water sources in these GPS. While discussing this issue with officials of the department of Drinking Water and Sanitation (DW&S) and the office bearers of the GPS, it was also realized that there are several ambiguities in water sources records.



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To address these issues and enable communities, PRIA initially organized a training program on the use of Global Positioning System (GPS) and orientation on utilization of water quality test kits. These programs developed the capacities of Field Coordinators, Field Animators and Jal Sahiyas⁵ so that they could mark the water sources (Hand Pump, Well, Tube Well, etc.), existing in different GPs. This also provided real time data on the water quality status (Iron, Fluoride, Arsenic, Micro Biological, etc.) of a particular water source. This exercise enabled communities to generate and access real time data and information.

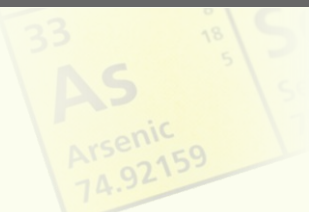
After this, the field animators and coordinators visited particular GP's where contaminated water sources are located. During their visits they also asked Jal Sahiyas, Mukhiyas, Pradhan, etc., to accompany them. With the help of GPS tool the team marked the geo-position of particular water source and also tested the quality of water of that source. These test were conducted with the help of the Jal Sahiya and elected representatives of Gram panchayats and the villagers.

The real time water source data from these tests and mapping exercise is uploaded onto Google Earth Map. This map for Ambadiha (of Mandro block) and Amanat Diyara (of Udhwa block) can be accessed at the following links: <http://goo.gl/JUVTYc> and <http://goo.gl/jkWM5x>

Village residents of Ambadiha and Mohapur are now aware of the existing water sources in their respective GPs. Because of the topo-sheets and its usage, they are aware of the existing water bodies and using this information to develop their water security plans.

They drafted their water security plans during 13 July to 7th August with the support of Civil Society Organizations (CSOs), Village Water Sanitation Committee (VWSC), GPs and Jal Sahiyas. This action is hoped to influence other GPs with each developing their respective water security plans soon.

Some challenges faced in this process was related to technical know-how. Since most of these plans were facilitated by the CSOs,



it made the process easier. However, the use of technical words like topographical sheets, water harvestings, water recharging, etc., were difficult for village residents to understand. They were also not able to comprehend the terms like overlapping of topographical sheets on revenue map. It is opined that it will take some time to build the capacities of the village communities to build technical plans.

The first steps seen towards building convergence of communities with

government is through the current draft plan that will be placed before Gram Sabha and then proceed to the Block Officials (Engineers) to be further vetted. After which this plan will go to the District Planning Committee so that it become the part of the district plan and for the allocated funds to be released by the government. It is through this extensive process that communities are involved with the local government in decision making processes.

TECH – KNOW CORNER

Through this section, we will aim to bring out information on some of the technologies available for arsenic mitigation that are not as widely known as the commonly used and understood ones. The section will also bring out other knowledge enhancing snippets on arsenic poisoning in general. The objective is two-fold:

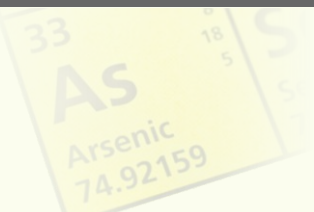
- To spread information on the variety of technological options available across the spectrum.
- To enable discussion on these technological options and work towards a consolidated understanding of the pros and cons.

ARSIRON NILOGON KIT

Presented here are details of the Arsiron Nilogon Kit, developed by the team at The Department of Chemical Sciences, Tezpur University, Assam. Feedback on this is welcome and contact details of the people behind the technology are given here.

Readers are also welcome to have further discussions on the network facebook group at the following link.

<https://fb.com/groups/arsenicnetwork/>



Arsiron Nilogon



A simple method of Arsenic and Iron Removal from Groundwater

Developed at

The Department of Chemical Sciences, Tezpur University, Assam

An Arsiron Nilogon Kit



5% Potassium permanganate

25% Ferric Chloride

Powder of Cooking soda

The Procedure (for 10 L of water):

Step 1: Take 10 litre of water in a container. Add 1 gram of baking cooking soda and stir for a while with a bamboo, wooden or glass stick to mix.

Step 2: Add 5% potassium permanganate to it as shown in the table overleaf and mix thoroughly.

Step 3: Add 1 ml of 25% ferric chloride and stir thoroughly.

(Steps 1 to 3 should take 3-5 min.)

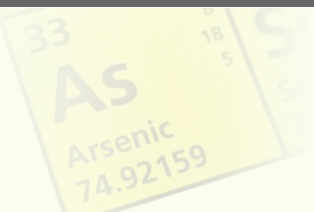
Leave the water for 1 to 2 hour to settle down.)

Step 4: Filter the top clear water using a sand-gravel filter or any other filter to get arsenic-free water.

Step 5: Pour the dirty residue to an earthen pot sand filter to collect the sludge for safe disposal.



For any help, please call Dr. Robin Kumar Dutta (9435006674), Ms. Shreemoyee Bordoloi (9706308228), Dr. Suresh Kumar Nath (9864206722) or Ms. Sweety Gogoi (9954490668).



Arsiron Nilogon



Table of doses for 10 litre of water having up to 500 ppb Arsenic:*

Groundwater type	Cooking soda	5% Potassium permanganate	25% Ferric chloride
Having no iron	1gram	0.1ml or 3 drops	1 ml
Having iron**	1gram	less than that gives a persistent light purple colour***	1 ml

*Increase the doses proportionately for larger quantity of water. Slight variation in the doses does not matter.

**Iron is removed along with arsenic.

***For water containing iron, add potassium permanganate until you see a persistent light purple colour in the water. Next time onwards, add just less than that. The colour will disappear after treatment.

(Please take help from a science teacher when you try it for the first time)

Two model Arsiron Nilogon arrangements:



For scientific detail, please see

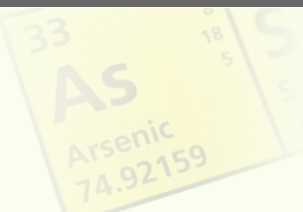
S. Bordoloi, S.K. Nath, S. Gogoi, R.K. Dutta, *Journal of Hazardous Materials*, **260** (2014) 618-626.

(Published by Dr. Simanta Hazarika on behalf of GWG)

ARSENIC LEVELS IN DAILY FOOD ITEMS

It is largely accepted that arsenic is present in varying amounts in the daily food items we consume. While there are no policies and standards for permissible levels of arsenic in most parts of the world including India, there is information on what could be the levels of arsenic in the daily food items consumed. There have also been market based surveys conducted to assess the levels of inorganic arsenic in food items like the following one:

Product	Origin	Total arsenic (ppb) ¹	Inorganic arsenic (micrograms/serving) ²
RICE (45 g, about ¼ cup uncooked)			
365 Everyday Value Long Grain Brown (Whole Foods)	³	210 to 282	7.4 to 8.4
365 Everyday Value Organic Indian Basmati White (Whole Foods)	India	82.2 to 99.9	2.9 to 3.5
365 Everyday Value Organic Thai Jasmine White (Whole Foods)	Thailand	104 to 150	2.7 to 3.0
Archer Farms Organic Basmati (Target)	India	54.7 to 81.7	1.3 to 2.2
Archer Farms Organic Jasmine (Target)	Thailand	112 to 121	2.7 to 3.9
Cajun Country Enriched Long Grain	LA	328 to 348	4.8 to 5.2
Cajun Country Popcorn Long Grain	LA	350 to 436	3.9 to 5.3
Canilla Extra Long Grain Enriched	U.S.	198 to 431	3.2 to 7.2
Carolina Enriched Extra Long Grain	AR,LA,TX	144 to 236	3.4 to 4.8
Carolina Jasmine Enriched Thai Fragrant Long Grain	Thailand	119 to 159	3.0 to 3.2
Carolina Whole Grain Brown	AR,LA,TX	277 to 318	6.4 to 8.7
Della Basmati Brown	AR	308 to 568	5.9 to 9.4
Della Basmati White	AR	191 to 227	3.5 to 4.5
Doguet's Brown	U.S.	283 to 342	5.6 to 6.4
Doguet's Enriched Long Grain	U.S.	124 to 219	3.3 to 4.4
Goya Enriched Medium Grain	³	196 to 297	3.8 to 5.1
Great Value Brown (Walmart)	U.S.	212 to 344	5.2 to 6.8
Great Value Parboiled (Walmart)	U.S.	138 to 239	4.1 to 4.4
Jazzmen Louisiana Aromatic Brown	LA	237 to 295	4.7 to 8.6
Jazzmen Louisiana Aromatic White	LA	168 to 209	3.2 to 4.1
Lundberg California White Basmati	CA	64.3 to 75.5	1.3 to 1.6
Lundberg Short Grain Brown	CA	169 to 204	3.8 to 5.4
Mahatma Extra Long Grain Enriched	U.S.	129 to 284	3.4 to 4.9
Market Pantry Enriched Long Grain White (Target)	AR,LA,TX	184 to 254	4.0 to 4.6
Martin Long Grain Brown	MO	113 to 455	3.7 to 9.6
Martin Long Grain Enriched	MO	133 to 193	2.3 to 3.4
Rice-Select Organic Texmati White	TX	330 to 917	3.8 to 4.8
Texas Best Organics Long Grain Brown	TX	252 to 287	4.2 to 7.6
Texas Best Organics Long Grain White	TX	138 to 226	3.2 to 4.3
Trader Joe's White Basmati From India	India	75.9 to 86.0	2.5 to 2.9
Uncle Ben's Original Enriched Parboiled Long Grain	U.S.	220 to 246	5.9 to 6.3
Uncle Ben's Whole Grain Brown	U.S.	209 to 285	5.7 to 6.7



Arsenic levels in common foods

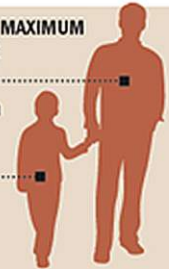
Arsenic intake occurs through food and drinking water with recent concerns focused on high levels in rice. Elevated levels of arsenic can cause lung, bladder and skin cancers, cardiovascular disease and hypertension and could cause neurological deficits and diabetes.

RECOMMENDED MAXIMUM ARSENIC INTAKE

220-lb. person
30 μg

50-lb. child
14 μg

 Health threat - **50+ μg**



RICE, RICE PRODUCTS

3.5-6.7 μg
per cup



MEAT*

Beef

0.1 μg per half pound



COOKED SPINACH

1.1 μg
per cup



Chicken

0.2 μg per half pound



GRAPE JUICE

2.3 μg
per cup



Shrimp

0.4 μg per half pound



*FISH

Fish has high amounts of organic arsenic that are not as risky to human health as inorganic arsenic.



Arsenic in water

WELL, SPRING, NATURAL WATER

- Concentration can reach 100-200 ppb (parts per billion) = 200-400 μg per 2 liters of water.

PUBLIC WATER

- Typical concentration: 2-4 ppb = 4-8 μg per 2 liters of water.

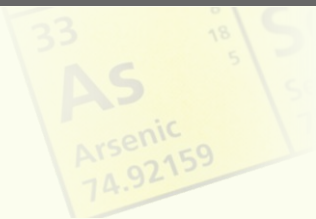
NOTE: 10 ppb is the maximum concentration allowed, or 20 μg per 2 liters of water.



Sources: "A Market Basket Survey of Inorganic Arsenic in Food," Food and Chemical Toxicology 37 (1999), by R.A. Schoof, et. al.

James Hilston/
Post-Gazette

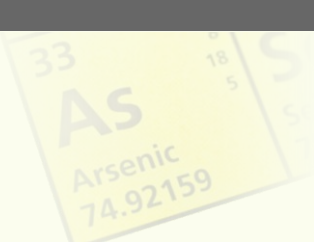
The above mentioned surveys were conducted by the US Food and Drug Administration (FDA) and other researchers in USA. There is a critical need for an exercise of a similar nature in India and for us to work towards creating a policy framework for arsenic standards in food items in India. The time is right for us to set the example for the rest of the world with such frameworks.



ARSENIC TRIVIA

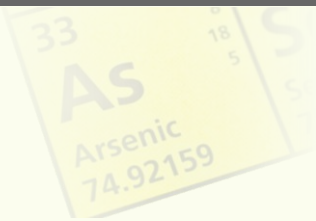
QUIZ

1. A teaspoon of naturally occurring arsenic will kill an adult male in good health.
 - a. Yes
 - b. Not always
 - c. Of course
 - d. Not at all
2. Which is the odd one out?
 - a. Realgar
 - b. Orpiment
 - c. Loellingite
 - d. Feldspar
3. Arsenic is a metalloid
 - a. True
 - b. False
4. Considered possibly the 'greatest' poisoner of all time. Who is she?
 - a. Midorina Pallazo
 - b. Lucrezia Borgia
 - c. Signora Toffana
 - d. Sinorina Taffeta
5. Historically, arsenic was widely used by females as a contraceptive.
 - a. True
 - b. False
6. Which of these famous people is now believed to have died of arsenic poisoning?
 - a. Napoleon Bonaparte
 - b. Emperor Nero
 - c. Alexander
 - d. Adolf Hitler
7. Discovered in the nineteenth century, this test is still used to detect arsenic poisoning.
 - a. Ranch Test
 - b. Proud Test
 - c. Anders Test
 - d. March Test



ANSWERS

1. A teaspoon of naturally occurring arsenic will kill an adult male in good health.
Not always
Arsenic in its natural state is not very poisonous, and, in fact, has been used over the centuries for medicinal purposes.
2. Which is the odd one out?
Feldspar
This is composed of Silicates of aluminium. The others are forms of arsenic. Realgar is orange-red arsenic. Loellingite is tin-white arsenide. Orpiment is yellow arsenic trisulfide.
3. Arsenic is a metalloid.
True
A metalloid is a non-metallic element that has some of the chemical properties of a metal or that can form an alloy with metal. In its solid form arsenic is either yellow or grey(metallic) in colour. It is a very brittle, crystalline solid.
4. Considered possibly the 'greatest' poisoner of all time. Who is she?
Signora Toffana
She is reputed to have been responsible for the deaths of over 600 people. She sold her 'Agua Toffana' or Water of Toffana as a cosmetic, in vials with the picture of a saint on them. Her customers were generally wives using the 'tonic' to kill their husbands. She was executed in Naples in 1709.
5. Historically Arsenic had a widespread use by females as a contraceptive.
True
Yes, someone decided that a deadly poison would make a great contraceptive. And not just Arsenic, Mercury and Strychnine have been used as well. Other options have included animal faeces or urine, so maybe it was a tough choice.
6. Which of these famous people is now believed to have died of Arsenic poisoning?
Napoleon Bonaparte
The latest theory is that he was slowly poisoned by fumes from the wallpaper in his prison. A pigment containing arsenic was used to colour the paper. Research has shown that a mould, formed from damp in the animal glue used in those days, can react with this pigment and cause the production of toxic arsenic vapour.
7. Discovered in the nineteenth century, this test is still used to detect arsenic poisoning.
Marsh Test
James Marsh was an English chemist who developed the test in 1836. It was a refinement of a test developed in 1775 by Carl Scheele. It is sensitive enough to detect 0.02 mg of arsenic.



NETWORK PROPELLERS

As the network expands its reach into newer areas and with increasing number of activities, it is imperative that local partners take the lead. Something similar has started in Assam with Eco Concept taking the lead.

Our Network Propeller for this issue is Eco Concept, a Guwahati based collective of motivated individuals with passionate ideas for environment conservation.



INFO-EXCHANGE

Knowledge curation and sharing is one of the important objectives of the network. There is a lot to learn from Bangladesh's experience with the arsenic menace and its efforts at mitigation, adaptation and knowledge creation.

Some of the material accessed by the network from Bangladesh is tabulated here <http://goo.gl/YXTejQ>. Those interested in accessing the same, do get in touch with us.

SECRETARIAT

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