

ARSENIC ALERT

40 Million at Risk: Needed Awareness Campaign

by Quamrul Islam Chowdhury

There is no definite cure for arsenic poisoning but uncontaminated water and nutritious food over a period of time nurture sufferers back to health. Unfortunately, there are few alternative water supplies in the affected districts and most of the people in the area can't afford nutritious food.

FORTY million people in rural Bangladesh are now at risk of arsenic poisoning. The number of patients seriously affected by arsenic in drinking water has now risen to 1420. In early 1996, arsenic poisoning of ground water was reported first from Bagerhat, Sakthira and Kushtia, all three south-western Bangladesh districts bordering India. By now the scourge has hit 19 rural districts along the border. Even bad news are pouring on to the table of Health Ministry that adjacent rural areas surrounding the capital city of Dhaka is arsenic-tainted. Stung by local newspaper reports of farmers dying in their huts, Bangladesh officials admitted in June 1997 that 40 million people — more than 30 per cent of the nation's population — live in the arsenic-tainted area, a 500 kilometer swath of golden paddies and steamy banana groves stretching between the Ganges river and the Indian border. Given the vast coverage of this catastrophe, a resource-constrained country like Bangladesh is therefore struggling to even capping arsenic-contaminated tubewells across the rural areas. Poor villagers are at the receiving end, ill-equipped to deal with the scale of the nation's still uncertain as to how to cope with this mass poisoning disaster.

True, the government is issuing warnings by radio and television. Three committees — arsenic steering committee, scientific research committee and technical committee — have been constituted to address the problem. A task force is being constituted to run district-wise programmes. Despite the efforts of the government and formation of these committees, mitigation measures are yet to be intensified. Much of the rural Bangladesh has caught up in a panic. Members of the Forum of Environmental Journalists of Bangladesh (FEJB) were the first who did break this bad news. Now FEJB members are trying to sensitize the officials and policy makers about the gravity of the disaster and putting their efforts in raising awareness among the rural community so that this panic can be averted.

What is Arsenic?

Arsenic is a white, semi-metallic powder found in nature. Some of its compounds — arsenite and arsenate — are highly toxic and can cause skin cancer, kidney and liver failure, respiratory problems and in extreme cases, death. Other ailments include dark brown spots on the body, thickening of the palms and feet, and warts on hands and legs. Colourless, tasteless and naturally occurring in the sub-soil, the arsenic has been seeping into the region's well water for a generation.

Experts feared that it might have been caused by excessive extraction of ground water.

toxic effluents of industries and overuse of toxic pesticides. Some experts say the arsenic beneath the fertile river delta Bangladesh was probably deposited eon ago after washing down from bodies of ore in the Himalayas. As long as the arsenic compounds called arsenic sulfides were submerged in ground water, they remained inert. But with the advent of intensive irrigation in the 1960s, the aquifers have dropped, exposing the poisons to oxygen for the first time.

The 'Teabag' Theory

A new theory has emerged. Once oxidized, arsenic sulfides become water-soluble. And like drops of tea seeping from a teabag, they percolate from the subsoils into the dropping water tables with every monsoon flood. As monsoons replenished the water table, the arsenic seeped into the tubewells, which rural Bangladeshi people rely on for drinking water.

But, Bangladeshi water expert Amjad Husain Khan observed that the arsenic contamination has originated in Indian state of West Bengal neighbouring Bangladesh, particularly on the east side of the Ganges-Bhagirathi contaminating ground water of Bangladesh. He said, western border districts specially southern region of Bangladesh is vulnerable to arsenic contamination because the sediments on both sides of the border have the same depositional history and geological environment the region being known as Ganges delta. Khan said, the aquifer of the contaminated zone in West Bengal and that of the region within Bangladesh are hydrologically connected. He said the ground water of the region along the south western border belt of Bangladesh is highly vulnerable to arsenic contamination.

The first reports of arsenic contamination appeared in 1978 in West Bengal in India. The initial theories that tried to explain the cause of pollution were many. Such as results of use of insecticides and pesticides, metal strainers in industrial effluents etc. But, subsequent studies proved such theories as wrong. The School of Environmental Studies (SOES), Jadavpur University, Calcutta, India started investigation in 1988 when sporadic cases of arsenic poisoning began to be reported in West Bengal in India. Their study said, for centuries, a 450-kilometer stretch of rich silt clay 70-200 feet below the surface in an area covering about 35,000 square kilometers. No problem arose until the 1970s when farmers of India began withdrawing huge amounts of ground water to irrigate summer crops, triggering chemical

changes in the soil. SOES scientists advise that if catastrophe is to be averted, ground water pumping must be reduced relying more on surface water use for irrigation. As water table falls, pyrites — a mineral which holds the arsenic — begin to oxidize and leach the poison, contaminating thousands of shallow wells in West Bengal in India. Bangladesh is now hit by this mass poisoning sickening hundreds of thousands of rural people.

Symptoms of Arsenic Poisoning

Physicians say the arsenic affected person develops fatigue, nausea, severe leg and stomach cramps, wart-like lesions on palms and soles of feet, skin and organ cancers and nerve disorders. And so on. Clinical investigation into the cause of arsenic poisoning revealed that the poor, already suffering from malnutrition, are the worst affected. At the early stage of illness, an arsenic poisoned person is affected by a variety of diseases including melanosis, keratitis, conjunctivitis, bronchitis and gastroenteritis. Peripheral neuropathies and hepatopathy are the next stages of this poisoning. At the final stage gangrene in the limbs and malignancy in neoplasm lead the poisoned person to death.

Bangladesh Situation

National Institute of Preventive and Social Medicine (NIPSOM) Dhaka have tested in December 1996, 1000 samples of tubewell water in 17 rural districts and found arsenic in 180 such samples. By June 1997 the number of affected districts rose to 19 out of another sample drawn from 24 districts. The arsenic toxicity in the water of the 17 affected rural districts — Bagerhat, Khulna, Sakthira, Jessore, Jhenidah, Chuadanga, Meherpur, Kushtia, Pabna, Rajshahi, Chapainawabganj, Narayanganj, Faridpur, Rajbari, Chandpur, Laxmipur, and Noakhali — is 25 to 35 times higher than the safety level set by the World Health Organisation (WHO). Permissible level of arsenic in water is 0.05 ppm, according to experts. Bangladesh Energy Commission found the level of arsenic at between 1.5 and 2 ppm in tubewell waters in districts bordering with West Bengal of India. The situation is so worrisome that even dangerous level of arsenic toxicity was found in the water of a tubewell of Bangladesh Health Minister Salauddin Yusuf's village home in Khulna. This tubewell has

already been sealed by the district Public Health Engineering Department. The number of arsenic poisoned tubewells is on the rise creating a panic across this rural belt.

Dhaka Community Hospital (DCH) has been conducting research works on it. The result of their investigation shows that the number of arsenic affected people is horrifying. Public health is in jeopardy in areas where arsenic poisoning is extensive. DCH conducted its research on arsenic poisoning among residents in four villages under Ishurdi thana of Pabna district, eight villages and localities of Kushtia district and one village of Meherpur district.

Water samples collected from the arsenic infected areas of the country contained more than normal percentage of arsenic. The results of the tests shows that 28 per cent of the affected people have more than 100 to 1500 per cent arsenic in their urine, 47 per cent have eight to 20 times in their nails and 98 per cent have 100 to 15,000 per cent more than normal arsenic in their skin. Twenty per cent of water samples contained arsenic which is 100 to 900 per cent more than the allowable quantity. Dhaka Community Hospital screened 920 patients suffering from skin diseases of whom 150 were suspected to have been suffering from arsenic poisoning. Samples of urine, nails, hair and skin were collected from 95 of those 105 patients. Water samples from 41 tubewells were also collected from the arsenic affected areas. These samples were examined at the Bangladesh Centre for Scientific Investigation and Research (BCSIR) and the laboratory of the School of Environmental Science of the Jadavpur University, West Bengal, India.

Social Fallout

As the mysterious sores first appeared on Anil Chandra Das's work-toughened hands, the grizzled rice farmer of Noapara, long hardened against the aches and pains of life in rural Bangladesh, just ignored them. But, the lesions didn't go away. Instead, the small purplish scabs on his palms began cracking and bleeding. Then the headaches started, accompanied by chest congestion and stomach cramps. And finally, last March, the man 'whom neighbours remember for his breezy storytelling, lapsed into a deadly silence. He just laid in bed all day and we looked into his eyes. Then one day he

didn't open his eyes any more. And we all began to cry," said Ila Rani Das, 16, Anil's daughter. Fighting tears, Ila recalled how her eldest brother, Shyamol, 20, died in August of the same grim symptoms. She held up her palms, the purple sores were there. She is not alone.

The social fallout is creating havoc. Amina Begum, 35, a vic-



Palms and feet of a victim: Signs of scourge

tim who developed dark brown spot on her skin is socially shunned. She is not alone. Girls with such spots are unable to find husbands, married women showing signs of arsenic poisoning are often sent back to their parents by their uncles, young men are refused jobs in rural areas. It happens over the heads of most of the villagers plagued by the epi-

dem — men like Abdus Samad, 33, who lost both his home and social status to arsenic. "My parents told me one day to leave home when I got sick," recalled Samad, a sad, wiry man whose hands and feet are still cracked with sores months after drinking from safe, arsenic-free well.

Shunned, his wife and he built a tin-roofed hut on remote corner of his father's property. "Everybody thinks it might be contagious, like leprosy," Samad said bitterly. "I washed my plates in boiling water for nothing."

Rasheda K Chowdhury, Chairperson of Environment, and Development Alliance said, the life of entire rural community has been affected by this catastrophe. She emphasized

on the need for intensifying the government and non-government measures to avert this scourge of arsenic poisoning that experts say has no equal in medical history.

Mitigation

Because arsenic poisoning often takes months or years to become lethal or debilitating, it can be easily misdiagnosed. If diagnosed early, mild symptoms can be relieved by drinking clean water. Continued exposure to contaminated water can be fatal. Kits that could filter arsenic out of the water cost almost a month's income for many in Bangladesh. The means to pipe in clean water could cost crores and take years to build.

Health Minister Salauddin Yusuf said his government has identified arsenic pollution as a national problem and is determined to solve it. He emphasized the need for joint action in this regard by other concerned ministries along with his one and said an extensive programme has been undertaken by his ministry at field level in the arsenic-tainted areas. He said that his government has taken measures to contain arsenic contamination through identification of patients, treatment, follow-up programmes, supplying pure drinking water, training doctors and creating awareness. But implementation in reality at the affected village level is yet to be geared up. Despite the Health Minister's call, a Taka 20 million project, undertaken jointly by the government and the UNICEF to conduct a survey in the arsenic affected areas across the country is yet to take off.

Health Secretary Muhammad Ali said a preliminary survey to identify arsenic affected patients has been conducted in 17 different rural districts of Bangladesh. He said instructions have been given to the Department of Public Health and Engineering to supply arsenic pollution free water in the affected areas. Besides, he said, instructions have also been given to test the tubewell water locally in every district.

Stressing on the need for undertaking preventive measures against arsenic toxicity, Dr Abdul Wadud Khan of NIPSOM said, his department has already developed a filter to purify arsenic contaminated water.

There is no definite cure for arsenic poisoning but uncontaminated water and nutritious food over a period of time nurture sufferers back to health. Unfortunately, there are few alternative water supplies in the affected districts and most of the people in the area can't

afford nutritious food.

Dr Mujibul Haq, Head of Dermatology Department, Dhaka Medical College Hospital said, with proper medication and access to pure drinking water, arsenic-affected patients can be cured but it is important to take advice from the experts at the early stage. Medicine for this is scarce now and steps have been taken to make those available, he added.

Water Development Board geologist Mizanur Rahman suggested rainwater harvest as a preventive. Storage and utilization of rainwater is a low-cost technology to counter arsenic contamination in the water, Rahman said. It is particularly pertinent to the monsoon season. A daily consumption can not be met with small filters, the government should take up a crash programme for mobilizing mass awareness. Rahman expressed his concern regarding disposal of the arsenic waste gathered in the filters. If the arsenic waste is randomly disposed, this can create further havoc through contamination of drains, ponds and other water bodies. Another blunder is to be avoided: don't simply sink the tubewells deeper to tap fresh water from a lower level. If you sink a tubewell deeper, this could serve to contaminate the pure water below.

The cast of characters in the emerging health disaster includes armies of quack doctors who prey on the poisoned victims, knowing that arsenic has no real cure other than switching to clean drinking water.

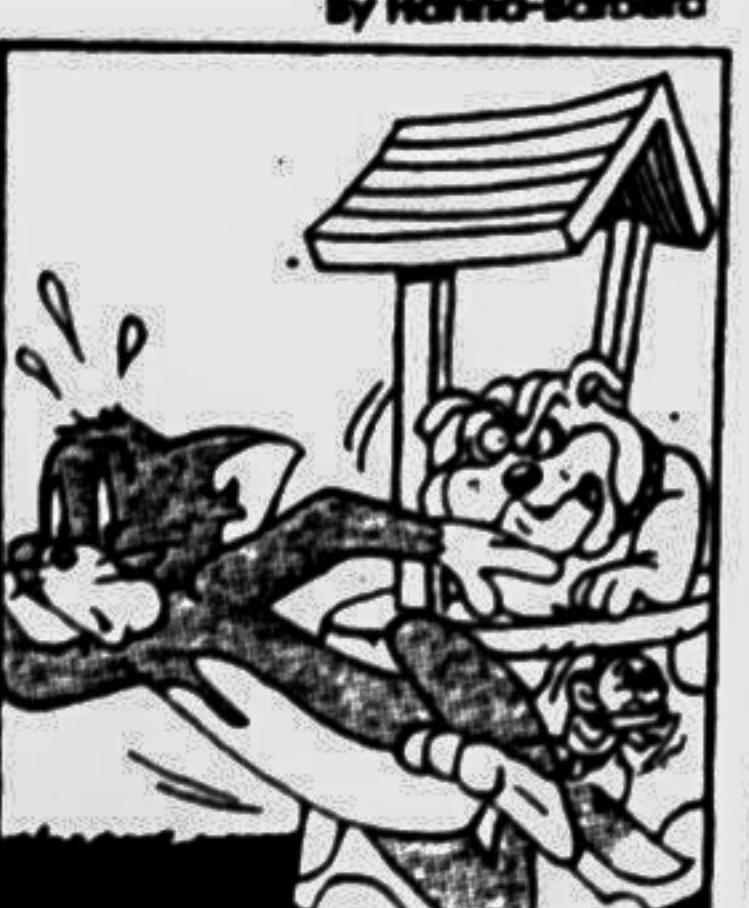
Conclusion

Once one of our paramount leaders, Moulana Abdul Hamid Khan Bhasani warned the proponents of the Green Revolution about the danger of over extraction of ground water. The policy-makers in 1960s did not pay heed to the warning of the wise old man whose words now come true. The Green Revolution is no more a hero, it has turned into a villain. By drilling hundreds of thousands of expensive tubewells to irrigate its high-yielding crops during the dry season, scientists now say the government has unwittingly exposed millions of its rural people to naturally occurring poisons in the ground water. There is no time to the decision-makers to lapse. They have to now act, act and act. They have to avert this mass poisoning.

The general secretary of Forum of Environmental Journalists of Bangladesh, the writer is a senior correspondent of BSS and a leading environmental activist.

This is a specially prepared version for The Daily Star of the report presented at the ES-CAP sponsored Regional Workshop on Promotion of Environmental Awareness in Rural Communities held at Bangkok on June 30-July 2, 1997.

Tom and Jerry



IAN FLEMING'S

James Bond



Metropolitan

Asiatic Society to compile 'encyclopedia of Bangladesh'

The Asiatic Society of Bangladesh (ASB) has undertaken a five-year project for compiling an encyclopedia of Bangladesh in ten volumes in Bangla and English, reports BSS.

A five-day workshop has been organised by the ASB on July 25-29 to get the draft project design discussed by panels of experts with a view to making the design as sound as possible academically. The participating scholars representing almost all disciplines will be grouped into six subject panels.

According to the ASB source, a large number of scholars from home and abroad will participate in the process of the preparation of the encyclopedia, the first of its kind in Bangladesh. The panels of the workshop will be on natural sciences, biological sciences, arts and humanities, history and heritage, society and economy and state and governance.

Weather

Day temp likely to fall

Under the influence of well-marked low over north west Bay off Bangladesh-West Bengal coast, heavy to very heavy fall is likely at places over Khulna, Barisal and Chittagong divisions in the next 12 hours till 6 pm today, reports UNB.

Met Office says moderate or moderately heavy rain or thundershower accompanied by temporary gusty or squally wind may occur at most places over Dhaka, Khulna, Barisal, Chittagong, and Sylhet divisions and at many places over Rajshahi division.

Day temperature is likely to fall by 1-2 degree Celsius across the country.

Country's highest temperature 32.0 degrees Celsius was recorded at Bogra and the lowest 22.0 degrees at Cox's Bazar.

Meantime, Cox's Bazar experienced the highest 239 mm rain in the last 24 hours till 6 pm yesterday. Kutubdia had 113 mm rain, Khepura 112, Chittagong 101, Sandwip 68, Majidicourt 59, Jessore 32 and Barisal 13 mm shower during the period.

The sun sets today at 6:47 pm and rises tomorrow at 5:23 am. Maximum and minimum temperatures and humidity recorded in some major cities and towns yesterday were:

City/Town	Temperature in Celsius	Humidity in percentage
Dhaka	max 29.4 min 26.1	86 91
Chittagong	27.0 24.7	96 95
Rajshahi	31.5 25.8	90 83
Khulna	26.7 24.8	93 92
Barisal	26.4 24.5	98 98
Sylhet	30.0 26.3	85 92
Cox's Bazar	29.5 22.0	97 95

Youths urged to resist conspiracy against country's sovereignty

Awami League general secretary and LGRD Minister Zillur Rahman yesterday called upon youths to unitedly resist the conspiracy against the sovereignty of the country, reports BSS.

He was addressing the inaugural session of the Triennial Conference '97 of Dhaka district Juba League at the Engineers' Institute in the city.

He said BNP leader Khaleda Zia, along with Jamaat-e-Islami, has been hatching conspiracy to turn Bangladesh into Pakistan.

The Minister said Khaleda has been opposing all the people programmes of the government as she and her party do not pursue the politics of people's welfare.

The inaugural session was also addressed, among others, by Bangladesh Juba League chairman Sheikh Fazlul Karim Selim MP.

Some Suggestions for Scientists

by Dr Mahboob Hossain

NOW it has been established that the arsenic poisoning of ground water in Bangladesh is a great national concern. At least some people have died and we do not know how many are being affected or going to get fatal diseases because of arsenic poisoning of ground water. Permanent solution of this big problem may be time consuming and difficult, but we need to know, immediately at least the temporary solution of the problem, I mean what the people should do before drinking arsenic contaminated water. Considering the economic ability of the people of our country I wanted to know the rapid, easiest and cheapest method of water treatment through Internet. I hope the following suggestions from the scientists and students of various countries (including Bangladeshis living abroad) will be helpful for the scientists, students and social workers who are fighting to combat the menace of ground water poisoning by arsenic in Bangladesh.

Many of them suggested to use charcoal, activated carbon and capacitors, etc. for relatively large scale water treatment. Among them one person suggested to get distilled water (as a small scale water treatment) for drinking from arsenic contaminated water using a very inexpensive and easy device and that is the use of polythene paper and solar energy. It deserves mention that scientists of BCSIR already have this inexpensive device which need to be popularised. Being a microbiologist I wholeheartedly support this device because I believe it frees water from arsenic and from microbes as well which cause hepatitis, typhoid, diarrhea, and other infectious diseases. Moreover, it will free nitrate from water which could cause cancer if beyond the acceptable limit. Following are the specific suggestions as I received.

On November 23, 1996 David Naugher of the Institute of Molecular Biology and Biotechnology of Simon Fraser University, Canada wrote, "Arsenate is poisonous because it mimics the chemistry of phosphate. It is readily absorbed and interferes with the chemistry of phosphate which is vital to life. One of the most insoluble salts of phosphate is calcium phosphate which is the mineral in bone. If crushed limestone is added to water being treated to remove arsenic, the arsenic will be removed. The water will be hard but much less poisonous."

On November 21, 1996 Mr Carol Limber wrote, "Filter the contaminated drinking water through charcoal. As you know, charcoal is easy to make. Your people are probably already making it. Change the charcoal in the bed monthly until you have a better fix on how often to change it by using (expensive) testing. Hope this helps."

On November 22, 1996 Dr Anise Ahmed from Washington (former Lecturer of Environmental Engineering of BUET) wrote, "Although chemical precipitation and ion exchange are pretty much known technology for removal of arsenic from ground water, these are also expensive. We talked about co-

precipitation and think that this may be promising. If you have high iron and/or manganese in ground water, if you remove iron and/or manganese, arsenic may also be removed (co-precipitation). When exposed to air, dissolved iron in ground water will be converted to ferric-oxide which forms a precipitate. The precipitate acts as adsorption site for the arsenic and some would be removed with the iron precipitate. The precipitation of iron is enhanced at pH greater than 7. "Another way to remove arsenic is the use of activated carbon. This may not be available or may be too expensive. However, I think you can just use wood carbon. Although how best it would work can only be found through trials. One problem with wood carbon is that it would make the water dark. However, if you have a sand filter that would take care of that. The wood carbon would have to be replaced soon as the carbon is saturated with arsenic and the water starts showing elevated arsenic levels. The wood carbon should be placed in a canister for ease of handling. This can be an idea for a cottage industry.

"One idea of elevated pH is to use wood ash (this is abundant in rural areas where cooking is done using wood as fuel). Of course, you would have to use a sand filter to remove the ash before water is made available for drinking."

On November 24 Tom Liberman from Ontario, Canada wrote, "I can point you in the general direction, though I can't give you direct answers off the top of my head. Basically, you need to complex the soluble arsenic into a relatively harmless form. Arsenic poisons mainly occur by going after, and binding with sulfhydryl groups (-SH) on vital enzymes in the body; just like most heavy-metal (Hg, thallium) poisons do. The simplest way of countering this is to provide an excess of sulfur to the arsenic, effectively saturating and neutralizing it before it binds with the body's SH groups. Ever heard of BAL? It stands for British Anti-Lewisite. Lewisite was (is) an organo-arsenic blistering agent/poison gas (actually liquid) used in WWI. BAL (also known as dimercaprol) was the antidote. BAL looks like this: CH₃-SH-CHSH-CH₂-OH. Notice the two-SH groups? It's an effective antidote in As, Hg poisoning. It 'chela'ts or complexes with heavy metal ions, rendering them harmless."

That's some background, but it doesn't really help you much since BAL is somewhat expensive and hard to come by.

It's also somewhat toxic. Now, to neutralise As-containing water, you could try more modern cheaper complexing agents. Sodium and calcium-sodium EDETATE come to mind, but I'm unsure how effective they would be. They're certainly cheap, and unless people are drinking As concentrations, that are pure poison, probably 500 mg/liter Na₂Ca EDETATE would do it. The stuff (the Na₂Ca version, calcium-complexed) is harmless and can be taken with impunity. Actually, according to Goodman and Gilman, it's poorly absorbed, which for your purpose is good.

"Finally, the cheapest; I would suggest using sulfur itself. In its elemental form it's probably too insoluble to do anything. That's why I'd suggest making a calcium polysulfide (CaSx) solution; i.e., sulfur-lime. That should be very inexpensive; just boil equal parts of sulfur and calcium hydroxide (lime) for an hour or so in water. Filter or decant the liquid. It'll smell bad, but toxicity in large dilutions is virtually nil. Add a few drops/liter of water. How effective is it? I really don't know. You'll certainly have lots of SH groups in the water for the As to complex with, but whether that'll actually keep it in a non-toxic form, I can't tell you."

On November 25, 1996 Mr Tom Liberman added, "Sodium thiosulfate (Na₂S₂O₃ xH₂O, forgot how much water the hydrate carries), or photographer's hypo is virtually non-toxic, cheap (at least by North American standards), and an excellent source of waters-soluble sulfur. Again, whether this form of sulfur will form a sufficiently stable complex with the As is a good question. pH will certainly be a big factor. If anything, toxicity of this material would be less than that of the CaSx I suggested earlier, though I think the toxicity is a non-issue for either material."

On November 27, 1996 Scott Hurd wrote, "I know you said not to recommend drinking distilled water because of its high cost but what if it is possible to make it simply? Using some clear plastic sheeting and some dark water impermeable material you may be able to make a solar still that will meet your needs. Hope this helps."

Finally, I would like to request the scientists of all disciplines to take united, immediate and effective step to save millions of people of our motherland from arsenic poisoning of water.

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