Arsenification: Searching for an Alternative Theory

They do not admit that upstream water diversion has caused shortage of recharging water, and consequently, the shortage of oxygen in the recharging water to let occur water's natural purification process, although they admit that in presence of oxygen in groundwater, arsenic will be scavenged by iron hydroxide

by Miah M. Adel

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The groundwater poisoning in the Bengal basin is the worst disaster in the history of human civilization. More than 75,000,000 people live under the threat of cancer due to drinking arsenic contaminated water.

My comments are on the article entitled " Mechanism of arsenic release to groundwater, Bangladesh and West Bengal" authored by R T Nickson, J M McArthur, P Ravenscroft, W G Burgess, and K M Ahmed and published in *Applied Geochemistry*, 1999. It seemed to me that the author group was introducing unrepresentative facts and figures for Bangladesh as representative ones into the world scientific community, which being recorded in the scientific literature might mislead scientists.

Facts about organic carbon are these: About 1 per cent of soil matter is organic. And about 60 per cent of organic matter is organic carbon. Or in other word, about 0.6 per cent of soil matter is organic carbon. Soil scientists from agricultural extension centers say that a 1 per cent organic matter or 0.6 per cent of organic carbon is equivalent to 20,000 pounds of organic matter in an acre of land that is six inches deep and that 90 per cent of organic matter lies in soil surface within the top six inches. Organic matter in soil comes from dead plants, animals, and insects. Leaching beneath the soil surface occurs for organic carbon from sugars and starch.

Surprisingly enough, the author group mentions that the organic carbon content in aquifer sediment is 6 per cent. Out of their ten samples, they find only in one sample above 6 per cent. Out of the rest, four are below 1 per cent in organic carbon content. Nothing has been said about the other five. Although, this 6 per cent would be much less than the 10 per cent found below the top six inches of the soil, if it is taken to be 10 per cent, the 90 per cent which lies within the top six inches becomes 54 per cent of the original. With the above clue of 0.6 per cent of organic carbon in 20,000 organic matter in a six-inch deep one-acre land, the Nickson group's finding suggests 1,800,000 lbs of organic matter within the top six inches of an acre of land in Bangladesh whereas the total soil content up to this depth in one acre of land is about 2,992,504 lbs. The Nickson group overly emphasizes on this data point. In their own words "This process is driven by the microbial oxidation of organic C, concentration of which reach 6 per cent C in aquifer sediment". The author group's fascination for this unfounded number goes beyond the boundary of scientific ethics. Their one sample 6.2 per cent organic carbon is being publicized as representative of the delta. Even if it is at all true for a specific site, a site-specific information cannot be representative for the whole country. Under normal procedure, the data should not be shown because of being 10 to 30 times more deviated from the average trend of the four other datapoints.

Even in a country like the USA which has got 55 per cent forest cover, about 1 per cent of organic matter lies in the soil. In a country like Bangladesh which is not even 9 per cent forested, how can such astronomical magnitude of organic matter be present?

In a recent response, Mr. Nickson pointed to the fact that one apple was enough to convince Newton. He should understand that Nickson's arsenic investigation and Newton's gravity meditation are two separate issues. They are not like even apples and oranges in shape. His group's 6 per cent organic carbon point is not tenable at all.

They think that organic carbon takes oxygen from iron hydroxide and arsenic is released in water with the production of carbon dioxide. However, they have not supplied any measured amount of carbon dioxide to that depth. They say that this reaction has been occurring for thousands of years. To the question of why arsenic contamination was detected in the nineties if organic carbon has been taking oxygen from time immemorial, their answer is not specific, rather vacillating.

They totally disregard the fact that people of the delta had been using groundwater for thousands of years. In 1941, there had been 50,000 villages and a population of 38,807,000 in the delta what is called Bangladesh today. The number of villages is now 87,000 and the population has risen to about 120,000,000. From the forties to the seventies, the number of open wells in a village varied from 5 to 10, on the average. The risk factor for the people living in the past can be calculated using the average individual weight, individual daily water intake, and the arsenic concentration.

The risk factor associated with the drinking of arsenic-contaminated water for an adult weighing 60 kg with a daily intake of 5 liters of water is 0.05 multiplied by the concentration of arsenic in water measured in mg per liter. It means if the concentration is 0.1 mg per liter, the risk factor becomes 0.05 x 0.1 = 0.005. This implies that five individuals out of 1,000 has the possibility of being affected with arsenic. If the concentration is 1 mg per liter, then there will be 5 patients out of 100, and for 2 mg per liter, there will be 10 patients out of 100.

If the age and the water intake are different, then the risk factor is the product of 1.75 arsenic concentration in water in mg per liter, and daily water intake in liter per day, and divided by the weight of the person. Today, the effect of arsenic contamination has broken out like an epidemic. Why is it happening now? Why did it not happen in the past? Here, again, come their myths and legends — people, possibly, had it but were wrongly diagnosed.

Furthermore, the scholars cannot deny the fact that today's tubewells are lifting the same water as was lifted from open wells in the past. Ravenscroft, one of his co-authors, finally admitted that water in open wells is neither in oxic (in contact with oxygen) nor anoxic (out of contact with oxygen) condition. Under this condition, how can an open well water cleanse itself of the heavy concentration of arsenic 1-2 mg per liter in matters of hours, the intervals between lifting of well water by its users? So, the current epidemic form should be existing in the past, too. Only exposure was not as such.

Concerns are raised for the authors for not admitting the fact that during the wet season the recharging groundwater carried 8-16 ppm of oxygen, which reacted with iron oxide to produce the scavenger (ferric hydroxide) for arsenic. However, the authors do admit the scavenging activity of iron oxide to pick up arsenic in presence of oxygen from a different source. They totally ignore the effect of surface water shortage. In no places do the authors mention the roles played by the lost surface water resources. Why is this negligence?

Groundwater flows from one part to another part in intervals of days, weeks, years, and even decades. These flows are classified as local, intermediate, and regional. Other than these flow systems, groundwater flows from higher elevation to lower elevation.

Mr Nickson refers to the Swedish group as supportive of their speculation. A Mr Prasam Banarjee from the Swedish group holds the opinion (New York Wagner College Conference, 1999) that the floodplain water in Bangladesh is void of oxygen. If that is true, how can fish be raised in floodplains? How can rice be cultivated in floodplains? And even how can deep water rice cultivation project work? Neither fish can live nor rice plants can grow without oxygen.

For information of others, let us take a trip around the Bangladesh land border with India. The great ring of dams and barrages and other water diversion arrangements include the ones upon the Madhumati, the Ichamati, the Betna-Kodalia, the Bhairab-Kabodak the Ganges, the Khukshi, the Atrai, the Punarbhaba, the Mahananda, the Karatoa, the Talma, the Ghoramara, the Seonai-Jamuneshwari, the Buri Teesta, the Tista, the Sangil, the Dharla, the Jinjiram, the Bhogai, the Piyan, the Kushiyara, the Sonai-Bardal, the Juri, the Manu, the Dhalai, the Khowai, the Sonai, the Gomti, the Selonia, the Muhuri, and the Feni. Each of these rivers played a unique role in their virgin state for the delta. The water diversion has reduced both the duration and the area of recharging surface water resources. The authors may point to "plenty" of surface water, or "winter rainfalls", the important point is to compare the current spatial and temporal availability of water to that at some base line year in the past. If water availability is reduced to one-half of the one that set up and thrived a wetland ecosystem for thousands of years, can that ecosystem survive? Outside investigators, although, may find water around, cannot think of the lost water resources to link them to the dilapidated ecosystems. This is what the author group is facing.

There are also major dams and barrages built around West Bengal. These include the Ajoy, the Mayurakshi, the Panchet Reservoir, the Maithon Reservoir, the Durgapur , the Tilaiya Reservoir, the Konar Reservoir, the Subarnarekha Multipurpose , and the Kansabati. The world's single most tampering of the water resources has taken place in the Bengal basin.

The major arsenic contaminated area falls between the Hoogli and the Padma and beside them. Plateus lie to the west of West Bengal. It is not unlikely that arsenic contaminated water from West Bengal seeps into Bangladesh groundwater because of higher elevation in West Bengal.

The Nickson group also states that "Under today's wet and oxidizing (21 per cent O_2) atmosphere, pyrite does not survive the natural weathering process and so does not occur naturally as a detrital material". How can such a statement be made for the delta? Have they tested the major part of the delta to make this statement? Why do they make such a statement without investigation? Once again, they may be befooling the scientific community.

The important thing is that any conclusion they make must be consistent in all respects. Water diversion has affected many sectors. The problem has become an interdisciplinary one. The authors must do an integrated investigation of the problem. The quality control of the work they do stands questionable. They seem to be teamed up with the Swedish and Indian groups to establish their got-up speculation in an environment where it cannot be fit. They do not admit that upstream water diversion has caused shortage of recharging water, and consequently, the shortage of oxygen in the recharging water to let occur water's natural purification process, although they admit that in presence of oxygen in groundwater, arsenic will be scavenged by iron hydroxide. In the process they happen to be playing ducks and drakes with the misfortune of more than 75,000,000 of the world's poorest people. An integrated investigation alone can lead to find proper solution.

Saturating Calendars with Ritual "Days"

by Brajesh Bhatia

IS the United Nations practice of designating days, years, decades even, to mar worthwhile causes, reaching saturation point?

At last count, there were 42 such commemorative occasions loaded into a calendar year. Can we keep track?

All kinds of days — father's, mother's, valentine, etc. — are celebrated all over world throughout the year. The United Nations family over the last 50 years has added many more to those already celebrated.

January and February are the only two months when the UN family does not observe any day.

Some focus on tangible issues, like food, water or tuberculosis or World Post Day, naturally. Everyone beefs, if the postman fails to ring twice and letters are delayed.

Others are abstract but equally pressing: Human rights, still trampled upon in far too many places, to concepts like "cooperation" and "tolerance".

Take this year 2000. It has been designated as the International Year for the Culture of Peace. And 2001-2010 is the International Decade for a Culture of Peace and Non-Violence for the Children of the World.

March has five such days: Women's Rights and International Peace on March 8; International Day for the Elimination of Racial Discrimination, 21; World Day for Water on 22, the World Meteorological Day on 23, and the World Tuberculosis Day on 24 — the last four constituted a straight four-day celebration.

Come April, we'll have World Health Day on 7, and the World Book and Copyright Day on 23.

May starts with Labour Day or Women's Day. That used to be a big day back when the Soviet Empire existed. Catholics also honor St Joseph the Workman on May 1.

World Press Freedom Day comes on 3, International Day of Families on 15, World Telecommunication Day on 17, and No Tobacco Day on 31.

The International Day of Innocent Children Victims of Aggression will be observed on June 4. This is followed by World Environment Day on 5, World Day to Combat Desertification and Drought on 17, and the International Day Against Drug Abuse and Illicit Traffick-ing on 26.

The month of July is leaner. It starts with International Day of Cooperation on 1. World Population Day on 21 follows. So is August. Only the International Day of the World's Indigenous People is observed.

International Literacy Day is observed on September 8, followed by International Day for Preservation of the Ozone Layer on 16, International Day of Peace on 19, and World Maritime Day on 24.

October is perhaps the busiest month. It has a total of eight days. The month starts with International Day of Older Persons on 1, World Habitat Day on 2, World Post on 9, International Day for National Disaster Reduction on 11.

Then, World Food Day is marked on 16, International Day for the Eradication of Poverty on 17, the United Nations Day on 24. A week-long observation of the Disarmament Week is from 24 to 30 October.

The International Day for Tolerance is observed on November 16, Universal Children's Day (varies in countries) on 20, World Television Day on 21, and International Day for the Elimination of Violence Against Women on 25.

There are seven days in December for these celebrations. It opens with World AIDS Day on 1, followed by International Day for the Abolition of Slavery on 2, International Day of disabled Persons on 3, International Volunteer Day for Economic and Social Development on 5, International Civil Aviation Day on 7, Human Rights Day on 10, winding up the year with the International Day for Biological Diversity on 29.

After a respite in the months of January and February, the cycle starts all over again.

— DEPTHnews.

Mideast Rivals Face 'Water for Peace' Challenge

Fears of future wars being fought over scarce water supplies have long been expressed. While some experts discount the likelihood, one region in the front line of any such threat is the Middle East. Gemini News Service reports on how worsening shortages there have prompted urgent calls for cooperation between long-time foes.

Doug Alexander writes from The Hague, Netherlands

A growing water crisis in the Middle East is threatening the peace process and could plunge the region into renewed conflict, say key players in the negotiations.

Some underground supplies have already been tapped to the point of collapse, and an increasing number of people — particularly in Palestinian areas — have little access to clean, safe water.

As populations expand, hundreds of millions of cubic metres are being drawn each year above the estimated 2.4 billion of annual renewable freshwater supplies.

With all sides conceding that serious shortages pose a threat, efforts are being stepped up to boost regional cooperation to tackle the problem.

"Water can be the beginning of full cooperation in the Middle East or it can bring more war," Jean Frydman, adviser to the Israeli Prime Minister Ehud Barak, told participants at the World Water Forum, who met in The Hague in March to discuss global water problems.

One major scheme that could help quench the regional thirst involves building a pipeline from Turkey. This is being suggested by Jordan, but the $38 billion project cannot be achieved without assistance from its neighbours, and is therefore affected by factors such as the stalled Israeli-Syrian peace talks and the struggling Israeli-Palestinian negotiations.

One envoy trying to foster regional cooperation is the former Soviet president Mikhail Gorbachev, who now heads Green Cross International, an environmental thinktank.

He met Palestinian, Israeli and Jordanian leaders earlier this year to dscuss water and regional stability. All expressed deep concern.

"I can say that concern was expressed in particularly strong terms by Mr Barak, who said that unless we solve the problem of freshwater resources in the Middle East in the next 10 to 15 years we could see a conflict ... that could be worse than all the conflicts we have seen here in this region," said Gorbachev. Similar sentiments, he added, were expressed by King Abdullah of Jordan and Yasser Arafat, the Palestinian leader.

Green Cross International is now examining proposals for solving the chronic shortages and seeking to bridge national differences.

While recent negotiations between Israel and its Arab neighbours have focussed on swapping "land for peace", a key stumbling block which remains is disagreement over "water for peace" demands. The Jewish state has been resisting Syrian attempts to win access to the Sea of Galilee — the former's biggest water source.

Meanwhile, both Barak and Arafat have listed guaranteed supplies as among their top five conditions for reaching a permanent settlement.

Palestinian-controlled areas in the West Bank and Gaza Strip are hardest hit by the shortages of clean water.

"The question of Palestinian wate rights has to get resolved before the peace process gets too far," said Aaron Wolf, a Middle East water expert at Oregon State University in the United States. "The situation in Gaza is critical....There is a level of shortage that needs immediate attention, regardless of costs."

Israel and Jordan have so far managed to tap water-bearing rock strata, boost irrigation efficiency and harness technology to squeeze out supplies, but shortages are still expected to get worse. Some aquifers in Israel, Palestine and Jordan are said to be beyond repair.

Jordan's water minister, Kamel Mahadin, said the problem in his country was exacerbated by high population growth and a large number of displaced people. "Water shortage is becoming permanent," he said.

As pressure builds for even closer cooperation on improving management, supply and conservation, Jean Frydman, Barak's adviser, pointed out: "Everybody arrives at the same conclusions: there is no national solution — there is a Middle East solution. What does it mean for Israel to solve its own problems if the Jordanians and Palestinians are dying of too little water?"

A Palestinian water expert, Ayman Rabi, said hopefully: "In my opinion, peace will start from a glass of water that someone can save in one country to satisfy the thirst of someone else in a neighbouring country."

Vetch Again: Do Governments Care?

by Badrul Hassan

WE have been consuming imported intoxicated foods without knowing the inherent danger in them. During the late 80's, our children had radioactive powder milk imported from countries affected by Chernobyl explosion in the former Soviet Union. Years back hundreds of metric tons of date expired wheat remained stranded at the port for a long time. We do not, however, have any idea whether that wheat was taken back or sold in the local market illegally. In recent days, delicious carps like Ruhi and Katla are imported from India with preservatives like formalin. It is also learnt that in order to quicken the growth of these fishes farms apply pip manure, which is not safe for human health. Everyday we are taking adulterated edible oil, non-iodized salt, unsafe so-called mineral water and many other foods and drinks. We do not know how many such food items we are taking.

Vetch was such a food item imported from Australia since 1992 and banned by the Government only last year. Vetch is a toxic legume containing Cynoanaline, and that was sold as red lentil (Mashur) in the local market. The ban on Vetch was imposed perhaps after a campaign launched against it by Proshika's Institute for Development Policy Analysis and Advocacy (IDPAA). Recently it has been reported that Vetch is being imported again within six months of its banning. According to a recent report published in a vernacular daily (29 March 2000, Daily Janakantha), Vetch is being imported under different names for different purposes. The alarming news is that the importers are collecting quarantine certificates from the proper authorities. Sometimes the customs office faces problems, since Australian authorities have been issuing certificates attesting to the safety of Vetch for human consumption, the report also said. According to another report (20 April 2000, Prothom Alo), the government could not confiscate Vetch since there was no precise rules and regulations to withdraw them from the market. As a result 2000 metric tons of Vetch which was imported and stored before its banning has been sold in the country illegally during the last six months. Claiming anonymity, Chittagong based importers admitted the fact that they had marketed the bulk of Vetch tactfully.

Initially government instructed four institutions for determining toxicity of Vetch. Those were BSCIR, IFNS, BSTI and BARI. In order to determine the toxicity of Vetch scientific tests like Destructive Infrared Analysis were required and none of those four institutions were equipped to undertake this type of scientific investigations. Therefore, they could not make any head and tail out of it and still did not report it to the government for the sake of public health.

A committee was formed by the Ministry of Health, Ministry of Local Government and Ministry of Commerce to take necessary measures so that Vetch could not be sold in the market. Field activists of LGED and health activists of Thana Health project were jointly instructed to confiscate Vetch for destroying. As a matter of fact, initially we learnt about Vetch recovery from remote thanas of the country through newspapers. Within one month it seemed authorities had discontinued the drive. It was also learnt that Vetch was used for making Iftar during Ramadan. The government had totally failed to stop the sale of Vetch.

A number of times the Government of Bangladesh promised to take action against this unfair and dangerous trade in the country. The Minister for Commerce and Industry, Tofael Ahmed said in an interview with the BBC (15 October 1999) that the government would take action against those who were responsible. When the press started publishing alarming stories providing information and expressing grave concern over the issue, the Government promptly banned Vetch. The incident coincided with the Prime Minister Sheikh Hasina's official visit to Australia. In this connection we remember the assurance by both Australian and Bangladesh Governments given to the press during and after the tour. The Trade Minister and Acting Foreign Minister of Australia Mark Vaile said (21 October 1999) export of Australian Vetch would be stopped and they would take appropriate steps against the guilty after joint inquiry by authorities of the two countries. After returning (23 October 1999) from Australia, addressing the newsmen, the Prime Minister blamed the local importers of Vetch for marketing it for human consumption. She also said the importers should be identified and action taken against them.

The irony is that both Australian and Bangladesh Governments failed to live up to their words. The pronouncement that had been iterated remained black and white in the official papers only. We do not know whether any joint investigation was attempted to identify the illegal Vetch traders either in Australia or in Bangladesh. Furthermore no legal action was taken against anyone responsible despite the fact that Bangladesh Government confiscated Vetch from different places in the local market. As a result the evil business quarters who had put off their illegal activities for a short while perhaps started to import Vetch again and sell them in the retail market with the help from their accomplices in both the countries.

Now the demand for safe food is gaining momentum around the world. Governments are aware of public health hazards even in the neighbouring countries. It is the duty and responsibility of the state to ensure safe food for its citizens. It is a shocking revelation that a country like Australia should show apathy towards the export of intoxicated animal food by a section of the Australian business community, even though Pulse Australia and Grain Council of Australia agreed that 'Vetch is unbalanced' for human consumption. In spite of Australia's strong assurance to the Prime Minister of Bangladesh it seems unfathomable how could Australian Vetch be exported to Bangladesh again. We want to place this issue before the conscience of the Australian Government. Would they allow the sale of such allegedly intoxicated food for their citizens? Would it be possible to export Vetch to the developed countries of the world? In that case, the government would have been subjected to legal action. They should realise that Bangladeshi consumers might loose faith in Australian food items for the Vetch scandal.

On the other hand, there must be appropriate rules and regulations in order to confiscate a banned item after its import. Bangladesh Government should take exemplary drastic action against those who are committing such serious offences and putting the public health at stake. Otherwise, in the near future the poverty-stricken people of our country will face serious health hazards and then the government will be helpless to do anything. Because we all know 'prevention is better than cure.'

Garfield ® **by Jim Davis**

A UNICEF report: Children aged between 10 and 15 account for 22 percent of workers at tanneries in Bangladesh. This violates the country's Factory Law 1965 that does not permit factories to hire under-14 children. Children who have just reached 14 can be hired, but only for five-hour work a day. a provision hardly practised.

Tannery job has serious health hazards. Chemicals used to tan hides and skins can prove fatal, especially for children. Zafar, an 8-year-old boy , died after simmering sodium chloride spilled over his face from a drum at a tannery factory at Dhaka's Hazaribagh in 1995.

The country's most tanneries -277-are located at Hazaribagh. There are 40 other tanneries in Chittagong, Jessore, Dhamrai and Savar. A United Nations Industrial Development Organisation survey says nearly 70,000 tons of raw hides and skins are processed in these tanneries a year. The untanned solid wastes are estimated at 28,000 tons. Tanneries at Hazaribagh releases nearly 2,500 gallons of chemicals wastes each day, contaminating the water of river Buriganga in addition to polluting the air, according to some recent researches. SHED, a non-government organisation, says tannery workers are vulnerable to intestinal diseases, blood pressure, rheumatic fever, common cold, cough, asthma, dysentery, fever, kidney problems, tuberculosis, chest pain and jaundice due to unhygienic working atmosphere caused by various chemicals.

The materials used in tanning process are sodium sulphide, dye, resin, finishing materials, artificial tanning materials, fat, liquor, preservatives, chromium powder, solvents and others generating toxic pollutants.

The government has taken up a project in collaboration with the United Nations Industrial Development Organisation to recycle the huge untanned wastes generated by tanneries of the Hazaribagh area to check pollution. Bangladesh, however, can't afford to wipe out the tanneries. Leather is one of the country's major exportables. NEWS NETWORK