Arsenic Poisoning in West Bengal

In the article "India's spreading health crisis draws global arsenic experts" by Pallava Bagla and Jocelyn Kaiser (News & Comment, 11 Oct., p. 174), there is no mention of Kshitish C. Saha, who was, to my knowledge, the first to detect and report cases of arsenic poisoning in West Bengal (*1*). Saha, who retired in 1987 as a professor and head of the Department of Dermatology at the School of Tropical Medicine in Calcutta, correctly diagnosed a rare dermatological disorder, arsenical dermatoses, in 1983 and went on to treat hundreds of arsenic-affected patients (*2*). After detecting a case of what he believed was arsenic-caused skin cancer, he began to analyze the arsenic content of the hair, skin, nails, and urine from his patients. His later research focused on establishing that arsenic was the cause of the poisoning. In 1987, he won the Glaxo Oration Award from the Indian Association of Dermatology, Venerology, and Leprology. His study of 1214 patients with chronic arsenical dermatoses from 61 villages in seven districts of West Bengal from 1983 to 1987 (*3*) created a solid foundation for arsenic research in West Bengal. He has now documented more than 200,000 cases. In fact, the photograph of nodular keratosis on a patient's feet that accompanies the News & Comment article shows one of them (*3*).

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As a member of the World Health Organization (WHO) team that recently visited some of the arsenic-contaminated areas in West Bengal, India, I would like to comment on the article by Bagla and Kaiser.

India's official response to the tragedy may have been "low-keyed," but it was not indifferent. The WHO team met with key central government (of India) and state government (of West Bengal) personnel. Everyone, including the state ministers of the departments of health and public works, is genuinely concerned with the alarming situation and is taking the appropriate steps to avert or mitigate the extent of the tragedy. Among the remedial measures contemplated by the government agencies, the following are especially noteworthy: (i) conducting a comprehensive and systematic survey of the number of tube wells (deep unconfined aquifers used as drinking water supplies) and monitoring the arsenic concentrations in the aquifers and the number of people exposed to chronic arsenic poisoning; (ii) conducting a comprehensive epidemiological study and other research and development activities, such as finding methods of arsenic removal; (iii) setting up treatment plants that ensure the supply of arsenic-safe drinking water; (iv) setting up specialized clinics for the diagnosis and treatment of arsenic skin lesions, including cancer; (v) instituting training programs for medical and paramedical staff working in the affected areas for the early detection and treatment of chronic arsenic exposure; and (vi) launching mass awareness campaigns.

Finding the solution to the arsenic calamity in West Bengal will require concerted efforts on the part of many organizations, scientists, and physicians. The scientific expertise in India and abroad should provide

the knowledge and technical support for the government agencies to efficiently, effectively, expeditiously, and economically tackle this silent epidemic.

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In Defense of Nannobacteria

Enough! As one of the discoverers of mineralized nannobacteria on Earth (*1*), I must come to their defense. They are so abundant in samples I have studied that I believe they may make up most of Earth's biomass. Yet they appear to be nearly unknown to many biologists, hence the questions about putative Martian nannobacteria (Letters, 20 Sept., p. 1639; Reports, 16 Aug., p. 924).

Nannobacteria with cells 0.1 to 0.4 micrometer in diameter have been cultured by Allan Pentecost from the hot spring waters at Viterbo, Italy (*2*). Nannobacteria 0.05 micrometer in diameter have been found in thickly packed colonies on decaying leaves in the San Marcos River in Texas (*3*). K. K. Akerman *et al.* have found forms they term "nannobacteria" in blood (*4*). If these are not nannobacteria, then what are they? Until we know, perhaps the term "protobiont" or "quasibiont" might be used.

Microbiologists should be aware that there are vast numbers of organisms detectable by scanning electron microscope in the 0.01- to 0.2-micrometer range happily precipitating all sorts of minerals, acting symbiotically to precipitate organic hard parts, and generally exerting what appears to be an enormous influence on Earth's surface chemistry.

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Cold Neutron Production

We disagree with the statements in Andrew Lawler's article "U.S. neutron scientists settle for less" concerning the availability of cold neutrons at pulsed neutron sources (PSs) (News & Comment, 9 Aug., p. 728) that cold neutron production is merely a "theoretical possibility" and that the associated technology lags behind that for reactors.

Because pulsed sources produce high fluxes of "hot" neutrons in a natural way, perhaps not everyone is aware of the success with which cold neutrons are being produced and exploited at PSs. It is actually easier to produce cold neutrons at a PS than at a reactor. The overall heat load is much less for the same peak neutron flux, and the required moderators are small in dimension and can usually be inserted into the neighborhood of the spallation target in a simple way. Thus, a moderator change can be accomplished in a few weeks. The cold moderator design, construction, and installation can be done within normal operating budgets. This is in contrast to the case for reactors, where the installation of a cold moderator is a major project requiring separate funding and usually a significant shutdown for installation. Moreover, the spectral and pulse characteristics can be tailored to fit applications.

The existing pulsed spallation neutron sources owe much of their success to cold moderator technology. The scientific prob-