

wave propagation in a post-project scenario).

I am curious to know how our scientists (not the ones who are doing EIA for the sponsors) respond to such projects, which obviously require an interdisciplinary approach. What is appalling is the complete silence from the earth sciences community of the country. I think here we have an excellent geological problem and an area where we can effectively intervene. Are we to leave all these important decisions to some influential bureaucrats and politicians who are clever enough to hide under some technicalities and poorly whetted reports? What about the national academies and other professional bodies of Indian scientists? Are they not supposed to take their

positions on such important issues based on considered opinions of independent experts; in this case, particularly from the earth scientists? Sethusamudram, as the name suggests, is part of an ocean that is being constantly bridged by natural sedimentation processes, and nature has been at this work for hundreds of thousands of years. I am sure, going by the rates of sediment build-up, in hundred of years there would be a land bridge connecting Rameswaram with Sri Lanka. Why disturb this process for questionable purposes? The technical, scientific and economic credibility of this project must be convincing and it should not be another disaster in the making. The concerned Ministry and institutes must present their results in an

open forum consisting of both national and international experts on such matters as well as other concerned persons and stakeholders.

1. Ramesh, R., *Curr. Sci.*, 2005, **88**, 536–537.

*Note: The views expressed here are my own and not necessarily of the institute that I am affiliated to.*

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## NEWS

### Cholera: The scourge of India and Bangladesh

Cholera has been endemic in the Ganges and Brahmaputra belt of eastern India and Bangladesh from very early times. This Asian pestilence 'Cholera asiatica' moved out of its homeland in 1817 and spread to Europe and America in a pandemic form causing widespread death and devastation. Due to partial improvement of quality of water supply and sanitation, the incidence of cholera has declined steadily and by the 1960s, many scientists in the field had hoped that cholera would die a natural death. In 1961, however, a new strain of cholera vibrio, haemolytic E1Tor, had started its march heading towards Philippines, Hongkong in 1962, Burma and Bangladesh in 1963, India in 1964, Pakistan, Afghanistan, Iran, Iraq, South of USSR in 1965–66 and finally to Europe and Africa in 1970.

Till 1991, scientists thought that only one family of *V. cholerae* (Called O1) and its variants caused epidemic cholera. But in 1992, large parts of Bangladesh and India, particularly coastal areas of Tamil Nadu and West Bengal were ravaged by a previously unrecognized strain, which was subsequently designated as O139. Since then, this strain has been isolated from 12 other Asian countries. The resurgence of O139 serogroup in September 1996 in Kolkata and the coexistence of both the O1 and O139 serogroups in much of the cholera-prone areas of India and

elsewhere, suggested that the O139 serogroup had come to stay and would be an entity to contend with in the coming years.

Cholera, a severe diarrhoeal disease leading to acidosis and death, is caused by *Vibrio cholerae*. The bug colonizes in the small intestine and its pathogenicity is due to the production of enterotoxin that binds to an epithelial ganglioside receptor. India has a long tradition of cholera research and several pioneering works led to early breakthroughs in the field of diarrhoeal research. 75 years after Koch had postulated the existence of a cholera poison, S. N. De from Kolkata discovered the cholera toxin in 1959. At about the same time, N. K. Dutta, a pharmacologist at the Haffkine Institute of Mumbai along with his colleagues reported the production of fatal choleraic diarrhoea in infant rabbits fed with multiple doses of sterile lysates of dense suspensions of *V. cholerae* strain.

Molecular characterization of *Vibrio cholerae* rough strains are found to contain O1 serotype-specific (*wbe*) genes and all currently known genes responsible for its virulence. 'Cholera toxin production ability of the rough strains was found to be higher (three- to five-fold) as compared to the smooth counterparts and this is regulated transcriptionally', says T. Ramamurthy, National Institute of Cholera and Enteric Diseases (NICED), Kolkata<sup>1</sup>.

According to Rupak Bhadra, Indian Institute of Chemical Biology (IICB), Kolkata, who has been working on *V. cholerae* for the past few years, epidemic *V. cholerae* O1E1Tor and O139 strains are prone to rearrangements leading to emergence of their variants within a very short time<sup>2</sup>. According to Rita Colwell, Dept of Microbiology, US-based University of Maryland, the discovery of O139 is a turning point in cholera research because researchers realized that new strains could arise from genetic recombination and gene transfer<sup>3</sup>.

Rukshana Chaudhuri of IICB, Kolkata is of the view that the environmental parameters impose a spatio-temporal control on the expression of virulence factors allowing the bacteria to colonize in the intestine before production of cholera toxin. Since cholera toxin causes massive fluid loss from the intestine, production of toxin prior to colonization washes away the uncolonized bacteria, limiting the infection<sup>4</sup>.

NICED proudly announces the two recent discoveries originated from studies conducted by scientists of recent years. A new oral cholera vaccine has been developed as a collaborative effort with scientists from two other institutes, Institute of Microbial Technology (IMT), Chandigarh and IICB, Kolkata. This new recombinant vaccine strain, designated as VA1.3 is derived from a parental strain VA1 which is

a non-toxigen with all toxin genes deleted. A cryptic haemolysin gene locus was introduced in the chromosome of this strain and through a series of genetic manipulations, *ctxB* gene was integrated. This strain provided full protection against the challenging dose of *V. cholerae* in animal model, and the vaccine is now undergoing human trial<sup>5</sup>.

A few years ago, scientists from the University of Maryland have found out that *Vibrio cholerae* has unusual high intake of salt, i.e. it absorbs most of the human body salt, thus its ancestral home must be in the ocean. Bhadra and his group from IICB have studied gene products of *Vibrio cholerae* needed for survival under cold shock and nutritional stress. Rukshana Chaudhuri has studied the effects of bile on the cell surface permeability barrier and efflux system of *Vibrio cholerae* strains.

Intestinal infection with vibrio species results in the loss of large volumes of water, leading to severe and rapidly progressing dehydration and shock. 'Without adequate and appropriate rehydration therapy, severe cholera kills about half of affected individuals', says G. B. Nair of ICDDR, Bangladesh. The introduction of oral rehydration therapy (ORT) has been very cost effective and has also simplified the treatment. In most cases patients can be treated initially with ORS.

'Preliminary studies show that Bangladeshi households who first filter their pond water through sari cloth, before drinking water, reduce the risk of cholera infections by approximately 50%', says Rita Colwell. However control of the deadly cholera still rests on education and improved sanitary conditions besides consumption of hygienic food and water.

In a nutshell, the various strategies that can be followed are: Isolation and treatment of patients; Management of contact of cholera patients; Anti-cholera immunization; Environmental sanitation.

1. Ramamurthy, T., *et al.*, *FEMS Microbiol. Lett.*, 2004, **232**, 23–26.
2. Nandi, S. *et al.*, *Microbiology*, 2003, **149**, 89–97.
3. Mekalanos, J. J. *et al.*, *Infect. Immun.*, 1999, **67**, 5723–5729.
4. Sengupta Nilanjan *et al.*, *Infect. Immun.*, 2003, **71**, 5583–5589.
5. <http://icmr.nic.in/niced.htm>

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## Aswathanarayana receives AGU award

Uppugunuri Aswathanarayana of the Mahadevan International Center for Water Resources Management, Hyderabad has received the 'Excellence in Geophysical Education Award' (2005) from the American Geophysical Union at a special award ceremony on 25 May 2005 at New Orleans, USA. 'The Award recognizes As-

wathanarayana's meritorious services in the cause of geoscience education in different parts of the world. He is the first Indian and the first from the developing countries to get this award.' Aswathanarayana was a Director of Center of Advanced Study at University of Saugar, Saugar, Madhya Pradesh (1967–80). He subse-

quently served as Professor and Director of State Mining Corporation, Dar es Salaam, Tanzania (1980–90) where he initiated modern laboratories. He is author of several books linking geoscience instruction with natural resource management and job generation.

## MEETING REPORT

### Towards a tsunami warning system in the Indian Ocean\*

The great earthquake of 26 December 2004 of magnitude 9.0 that originated 200 km off the west coast of Sumatra, was perhaps nature's wake-up call. A wake-up call to tell us that nature will continue its own acts, and we need to prepare ourselves to face the inevitable. This time it occurred in the form of a tsunami, quite an unusual

occurrence in the Indian coast. Not that it has never occurred in the past. History tells us of three older episodes – 1881, 1941 and 1945 – none so devastating as the 2004 tsunami. The first two originated from earthquakes in the Andaman and Nicobar region, and the third from an earthquake in the Makran coast. The 2004 tsunami was a reiteration of the enormity of damage that could be caused by a tsunami generated more than 2000 km away from the Indian coast. Even countries far away, such as Maldives and Somalia were not spared. The lesson that came through

was that we cannot afford to ignore some of these seismic sources located far beyond our political boundaries. How should we gear up to handle such events in future? What are the shortcomings in our existing set-up? How could we improve them? And what should be our approach towards setting up a tsunami warning system in the Indian Ocean?

A brainstorming session provided an excellent forum to deliberate on some of these issues. This event, attended by nearly 200 delegates brought together an array of specialists – seismologists, geo-

\*A report on the brainstorming session on tsunamis organized jointly by the Departments of Science and Technology, Ocean Development and Space, together with CSIR and INSA on 21st and 22nd January at INSA, New Delhi.