Has BSE-contaminated cattle feed entered India?

By now it is well known that bovine spongiform encephalopathy (BSE), popularly known as mad cow disease in the UK, is due to prion-induced brain pathology in cattle. In sheep reared for the wool, the prion causes scrapie, a form of encephalopathy which makes the sheep rub (scrape) its skin against fences or walls. Scrapie has been known to occur in the UK for several decades. Feed fortified with dried and powdered portions of the carcasses of sheep was used for cattle in the 1970s in the UK, resulting in the trans-species spread of the prion infection and consequent BSE. Humans got infected, although very infrequently, by eating beef of cattle incubating BSE prion infection. Once this sequence was unravelled, the tainted cattle feed was banned from use in the UK and other European countries in 1988.

There was a report in October 2000 in *The Hindu* citing *The Observer*, that the tainted cattle feed was exported from the UK during 1988 till 1996 (for eight years) to a dozen countries in Africa and Asia[1]. Although Sri Lanka and Thailand were named, India was not among the countries listed in that report that had imported the tainted feed.

In February, the *Asiaweek* reported that even India had imported the potentially BSE-contaminated cattle feed[2]. I quote: 'Until 1996 Britain continued to export tons of meat and bone meal made up of pulverized cattle parts. That was eight years after the practice of feeding cattle with the meal was banned at home, specifically to halt the spread of BSE. By the time Britain stopped shipping the stuff, cattle farms in India, Indonesia, Japan, Singapore, South Korea, Sri Lanka, Taiwan and Thailand had fed it to their herds'[2].

There is urgent need to verify if the report is true, and if so, which farms had fed it to their animals. An Expert Committee must be immediately constituted to advise the Central Government and stringent measures should be taken to contain the spread of infection from the animals fed with the tainted feed. Indian sheep and goats do not have scrapie and by extrapolation we can safely assume that there is no prion infection among them. We must not allow prion infection to enter India and must take immediate steps to ascertain if the domestically banned cattle feed from the UK had indeed entered India.

The purpose of writing to *Current Science* is for early and wide dissemination of this information, so that scientists and managers of animal husbandry in various states will be alerted without further delay.

1. Suroor, H., *The Hindu*, Chennai, 31 October 2000, p. 14.
2. Editorial, *Asiaweek*, Hong Kong, 23, February 2001, p. 19.

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National Disaster Mitigation and Reduction Institute – An immediate necessity

Earthquake prediction is still beyond our grasp. This is further confirmed by the 28 February 2001 Seattle (USA) earthquake. While attempts to overcome prediction problems still continue, experts in USA spend more time and energy in carrying out R&D efforts to reduce losses to humanity due to structural failures. This concerted effort is paying rich dividends, as is evident from the post-Seattle earthquake scenario.

In India, the picture is completely different. Our complacency and adhocism at all levels is responsible for our failures. The disaster, in the form of Bhuj (Kachchh) earthquake, that has shocked us so much should not leave us just numb and helpless or complacent. It should make us, the earth scientists, tighten our belts and address the problems with a commitment. As a first step in this direction we have to study and restudy the various data sets, available within and outside the country, identify the subtle signatures that could provide answers to this disaster and prepare us to put into full use the 'disaster continuum model'[1].

In Kachchh, the central uplifted block is flanked by two major faults. Both are associated with neotectonic activity as evident from the 1819 (Allahbund), 1956 (Anjar) and 2001 (Bhuj) earthquakes. The integrated geophysical studies in Kachchh on land have brought out vividly the subsurface structure of various continental segments of Kachchh on land and the geometry of different fault zones[2,3]. But we lack sufficient surveillance network to link information from these results with strong-motion particulars, viz. ground acceleration, stress–strain pattern, etc.

In the recently conducted Indo-Italian workshop at the National Geophysical Research Institute (6–8 March 2001), the Italian scientists have brought into focus the importance of ground-motion studies and advocated the need for using scaled source and extended source models to better understand the ground acceleration, rupture mechanism, etc., for predicting ground motion from an event. Even though such a study does not lead to actual short-range prediction of an earthquake, at least it provides region-specific ground motion and peak acceleration details to help in evolving area-specific building codes. Since raw and valuable

data of different forms are available from Kachchh (instead of waiting for an approved plan of action), the earth scientists could carry out the above suggested and detailed micro-zonation studies immediately in earthquake-prone areas to provide valuable inputs for proper construction of earthquake-resistant structures.

In this respect we have to emulate the efforts made by USGS. As the nation's largest water, earth and biological sciences and civilian mapping agency, the USGS works in cooperation with more than 2000 organizations across USA to provide reliable, impartial, scientific information to resource managers, planners and other customers. This information is gathered in every state by USGS scientists to minimize the loss of life and property from natural disasters, contribute to sound economic and physical development of the nation's natural resources and enhance the quality of life by monitoring water, biological, energy and mineral resources. USGS provided all the relevant information on 28 February 2001 Seattle earthquake by the same evening itself, through the Internet (http://www.geophys.washington.edu/seis/PNSW).

Such prompt action and data dissemination is possible only when we have a scientific organization purely committed to the task, without hindrances from any quarter.

Since our country is continuously affected by different types of disasters, we should have a common centre/institute wherefrom we can provide valuable inputs to state and central governments and to the extent possible even to the common man. This institute should have both experienced and young individuals, who have single-minded service-oriented attitude. Even though it sounds like a 'dreamish ambition', I am sure we can establish such an institute if all like-minded individuals come forward to help in this venture. This institute should have experts from earth system, structural engineers, social workers, experts in planning and economics. For obvious reasons cited above this should be named 'National Disaster Mitigation and Reduction Institute', instead of the normally known 'Disaster Management Organization'.

1. Reddy, P. R., *Curr. Sci.*, 2000, **21**, 1045–1046.
2. NGRI Tech. Report, NGRI-2000-EXP-296 (Restricted), 2000.
3. Gupta, H. K., *J. Geol. Soc. India*, 2001, **57**, 275–278.

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Seismic wave amplification – One more example as evidenced at Ahmedabad (Cambay Basin) on 26 January 2001

As discussed earlier[1–4] with reference to Burdwan, West Bengal, India and Seattle, USA seismic wave amplification phenomenon has been felt and has also created panic and destruction in Ahmedabad and other towns and cities in the Cambay Basin (graben) region in central and north Gujarat during the 26 January 2001 Bhuj (Kachchh) earthquake of 8.1 magnitude and aftershocks related to it. The epicentres of the earthquake and aftershocks are as far as 300 to 350 km from the towns and cities which have experienced destruction of various intensities. The aftershocks, which were recorded even after about more than six weeks were on the scale of 3 to 5.1 magnitude and are also being regularly felt by people of the Cambay Basin region. Development of cracks in majority of the 'C' type RCC column–beam structures indicates that the intensity on Michalias Menten scale could be more than 7 in Ahmedabad area and in Cambay Basin. These clearly indicate the phenomenon of seismic wave amplification in the Cambay Basin as discussed for West Bengal[1] and Seattle[2], as well as New Delhi[5].

The surface geology of the Cambay Basin consists of loose sediments ranging from > 60 m to > 500 m depth. The sediments are chiefly sand–silt–clay beds and lenses in alternations with few pebbles and calcrete pebble bands. Proportion of clay, silt and sand varies in different beds. Sediments are considered to be of alluvial origin, with few aeolian cycles towards the surface and estuarine to marine Tertiary sediments at depth. Palaeo-channels, palaeo-meanders and meander scars are common in the central and southern parts of the basin, which contains shallow vadose water pockets. The water level ranges from 50 to 150 m below the surface in multi-aquifer system in various parts of the basin.

The epicentre of Bhuj earthquake is on the east-west trending Kachchh mainland fault, while the extension of the Cambay Basin is almost north-south bounded by parallel faults. Ahmedabad is almost at a perpendicular distance from the epicentre, where destruction is the maximum. The propagation of the seismic waves might have been at a tangential angle more or less parallel to the surface from a distance of 300–350 km to the Ahmedabad region. As suggested earlier[1], here also the energy propagation could be attributed to trapping of the seismic energy by low velocity surface units (loose sediments) and propagation of waves at low tangential angle above the water table from the epicentre. The vadose water in the palaeo-meanders, meander scars and palaeo-channels must have created liquefaction of loose sediments at shallow depth and quick sand condition. The development of liquefied sediment-related structures (sand and mud-volcanoes, sand and mud-flows, along fissures and cracks, silty and muddy saline water fountains, sand domes, sand holes, sediment dykes, etc.) along the lower part of the Sabarmati river and adjacent areas from Fatehwadi near Sarkhej (~ 10 km from Ahmedabad) up to Gulf of Cambay and in Rann of Kachchh indicates such a condition. No such development is found in Sabarmati river upstream of Ahmedabad where shallow groundwater is absent. The same can be said about Greater Rann of Kachchh, where large amounts of mud and sand oozed out along with water,