

## In this issue

### Endomyocardial fibrosis

We publish on **page 123** a review by Prof. V. Ramalingaswamy of the proceedings of an international seminar on 'Endomyocardial Fibrosis' (EMF) held in Trivandrum. We are told that medical research in India is like Miss Muffet of the nursery rhyme – *when she was good she was very very good, when she was bad she was horrid*. We feel that the seminal work of Valiathan and his group (at Sree Chitra Tirunal Institute) on the geochemical basis of tropical EMF belongs to the former class. In his essay 'The Geography and the Heart' (*Curr. Sci.*, 1990, **59**, 908), Valiathan asks: '*The connection between the world without and the heart within is scarcely apparent; does the heart sense geographical events?*'

The pioneer in this field, C. F. Davies (who was at the conference), is credited with the first discovery of the EMF syndrome in 1948 when he was at the Makerere University in Uganda. In 1968 the physician C. K. Gopi identified EMF as a disease endemic in Kerala.

EMF is the disease of the heart muscle and its prevalence, for some strange reason, is highest in countries within 12 degrees of the equator. The disease advances by the progressive growth of the fibrosis tissue leading finally to heart failure. On the cover of the book is a photograph of an EMF heart, with its fibrosis well delineated and it proves the ancient adage that one picture is worth a thousand words.

One of the theories that gained much popularity some time ago is that EMF in the tropics and the Loefflers cardiac disease of the temperate zone were both due to

injury caused by the eosinophil. The Sree Chitra group was not at all happy with this theory. They produced masses of evidence (see for example, Valiathan and C. C. Kartha, *Curr. Sci.*, 1990, **59**, 908) as did many others at this conference, to reject this hypothesis. Kerala statistics showed that the victims of this disease are mostly children and young adults from the poorer groups. Since early 1980 Valiathan speculated whether the cause of EMF was magnesium deficiency which is usually associated with the socially deprived. Since magnesium deficiency is known to enhance the absorption of many metals into the system he was on the lookout for a culprit element which could replace magnesium and cause damage to the heart. One understands that M. G. K. Menon suggested that it was important to study the effect of the radioactive element thorium present in the monazite sands of Kerala. The Sree Chitra group looked for and found, in 1986, thorium deposition in the heart muscle of those who had died of EMF.

Another physicist studying the transformation of rare earth elements felt that cerium, so abundant in monazite (36%–38%), may be a better candidate as it is multivalent, very active and a good oxidizing agent in the tetravalent state. The discrepancy in the ionic radii between cerium and magnesium however need not be taken too seriously as the mechanisms applicable to crystallography and to biological systems may be totally different.

With such slender leads the Sree Chitra group persisted with their theory and forged ahead. They found cerium in the heart muscles of

patients who had died of EMF (1989). To establish that cerium was the root cause of EMF, they planned and performed a series of elegant and convincing experiments. *In vitro* higher levels of cerium and lower levels of magnesium stimulated heart cell proliferation (Nair and Shivakumar). They discovered (see Kartha, C. C., *Curr. Sci.*, 1993, **64**, 598) that fibrosis in EMF is the result of collagen synthesis in cardiac fibroblasts.

Systematic evidence was slowly but surely accumulated (see **page 99**) to support the geochemical hypothesis – that (a) poor children are prone to magnesium deficiency; (b) which in its turn enhances the absorption of cerium from the environment; (c) the cerium toxicity provides the basis for the initial lesions; and (d) the presence of cerium also increases the collagen synthesis.

Many more experiments have still to be done to establish the theory universally. It is necessary to prove that the same geochemical situation exists at other places where tropical EMF is prevalent and cerium is the real rogue element. The rare-earth element cerium is not so rare; it is much more abundant in the earth's crust than the more familiar elements like zinc, lead or tin.

What does one do now? The complete eradication of social deprivation has still to be achieved in this country. The layman can only dream. Can the disease be detected in its incipient stages?; Can the cerium absorption be inhibited by using chemical or biochemical means?; Or can the element be leached out or substituted by a more benign element before too much harm is done?

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