

cernable just slightly to the right of the centre of the image. More interesting are the molecular defect structures unearthed by Narlikar *et al*. Figure 2b shows a pair of pentagons sharing a bond on a distorted C_{60} surface, forming a fulvalene unit. Figure 2c shows a rare occurrence in fullerenes and related structures, viz. a seven-membered ring. It must be recalled that five-membered rings provide the positive curvature required to close a structure comprising mostly six-membered rings. Seven-membered rings would tend to undo this positive curvature. In isolation, seven-membered rings are associated with saddle points, and can give rise to a veritable zoo of interesting cage structures with both convex and concave surfaces. The point mentioned earlier about the invasive nature of STM would be in order here. When imaging poorly

conducting samples, one is operating at biases as high as 1–2 V. This potential drops across distances of the order of Ångströms, resulting in fields of the order of bond energies. The question of the technique itself affecting the structure is thus one that needs looking into.

Defect fullerene structures are of considerable interest in part because of the sheer wonder that a structure as perfect as C_{60} forms under such refractory conditions. Such defect structures have been studied, for example, using semi-empirical quantum chemical calculations³ as well as various *ab initio* molecular dynamics (MD) methods^{4–6}. In the MD studies it was found that a cluster of carbon atoms rarely annealed into defect-free cages, largely because sufficiently long annealing times are computationally inaccessible. By turning this argument around, one might

ask whether defect fullerene structures can be obtained by quenching the carbon vapour in the arcs used for their preparation. Until this is possible, one can only follow the example of Narlikar, Samanta and Dutta and, in the manner of Lepidopterists, hunt for unusual species in the carbon family, only with the butterfly net being replaced by an STM.

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COMMENTARY

Acute toxicity of vitamin A in infancy

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A recent paper¹ from Bangladesh entitled 'Acute toxicity of vitamin A given with vaccines in infancy', reports that 11.5 per cent of infants who received a massive dose of synthetic vitamin A at the level of 50,000 IU developed fontanelle bulging indicative of increased intracranial tension. Commenting on the proposal to include vitamin A administration with EPI the authors point out that 'neither the efficacy nor the safety of mass vitamin A administration to infants have been established'. The infants studied were less than six months old but there is evidence that older infants are also vulnerable.

Hathcock *et al.*² had also earlier reported that children and infants are more susceptible than adults to vitamin A toxicity. Symptoms of vitamin A toxicity in children include, apart from bulging of fontanelle due to increased intracranial pressure, anorexia, drowsiness, irritability vomiting and liver

damage^{3,4}.

Indeed even children of pre-school age are vulnerable to vitamin A toxicity as Florentino *et al.*⁵ in Philippines had shown in a double blind study involving 2,471 children in their country. Earlier studies in NIN had also provided evidence of such toxicity.

Though only 11.5 per cent of infants were reported to have exhibited fontanelle bulging, it is reasonable to expect that a much larger percentage had in fact developed increased intracranial pressure which had not reached levels high enough to manifest as bulging fontanelle. Though fontanelle bulging and other side-effects were found to subside after a few days, increased intracranial tension is likely to have persisted for quite a few days after the subsidence of the clinical sign of fontanelle bulging.

Under the circumstances, we have reason to be deeply perturbed by the reported attempts to promote the use of massive doses of synthetic vitamin A in infants as an adjunct to the EPI

programme.

There is no evidence that vitamin A deficiency is at all a public health problem in infancy. It is universally agreed that the logical way to combat this problem in children is to build up maternal stores of vitamin A during pregnancy, through dietary improvement consisting of the inclusion of inexpensive carotene-rich foods in the diets of pregnant women. There is an abundance of carotene-rich foods in the countries where synthetic vitamin A is sought to be promoted.

The attempt to 'ride' the massive vitamin A dose approach on EPI is unwise for other reasons as well. There is no documented evidence that simultaneous administration of massive dose of vitamin A along with vaccination does not impair the immune response following on vaccination, with respect to all vaccines involved in EPI. Also, since vaccination is, in a sense, pseudo infection, it is reasonable to expect that the retention of vitamin A given simultaneously with vaccination will be poorer than with vitamin

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A given alone. If the object is to promote maximal vitamin A retention and not just to capture children then the time of vaccination is an inappropriate choice for vitamin A administration.

If 11 per cent of infants receiving massive vitamin A dose along with vaccination are going to develop visible signs of intracranial tension, there is the very real danger that the EPI programme will suffer because of poor compliance. EPI is of proven benefit; massive vitamin A oral dose in infancy, to say the least, is of doubtful value. We certainly should not allow an excellent programme of indisputable value to be ruined by a dubious 'fellow traveller'.

Latham⁶ had recently pointed out that whatever effect vitamin A administration is claimed to have had on child mortality may be largely explained by reduction in deaths following on measles. Measles vaccination is a far more certain way of bringing this about than vitamin A administration. It will be unwise to do anything which will reduce the acceptability of EPI by the community.

One-third of infants in South Asia are

of low-birth-weight to start with and show signs of psychomotor deficits at birth. Our attempt must be to help them overcome these initial handicaps. Subjecting these poor infants to repeated episodes of increased intracranial tension could contribute to further retardation of their brain development. A significant part of overall development of the brain takes place in the post-natal period.

Before any procedure is recommended for adoption, especially on a public health scale, its safety must be established beyond reasonable doubt. We have no studies whatsoever on the effects of repeated episodes of raised intracranial tension on the development of the brain in the post-natal period, especially in infants who start their lives with psychomotor deficits as a result of intra-uterine growth retardation.

It is strange that a wholly unnecessary procedure, the safety and validity of which have not been adequately tested and proven and which could undermine the confidence of poor communities in EPI, is sought to be promoted by some agencies and commercial interests. Surely there

must be more legitimate and less hazardous ways of expanding the market for favoured commercial products. Why pick on defenceless infants of poor countries for such unethical (mis)adventures?

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Technology development trends in India: Past, present and future

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The recent liberalization policies of the Government of India aimed at rapid economic growth of the nation through extensive foreign investments in almost all sectors and the emphasis on global competitiveness have raised several questions in regard to indigenous technology development and its relevance to the present day context. A review, therefore, of the technology development policies of the past in comparison to the current trends will perhaps be not only useful but also necessary to enable us to plan our future programmes. Many such articles and reviews have already appeared in print and this is yet another attempt to bring to focus the various issues involved so that there can be a serious debate leading to productive and meaningful guidelines and policies for the future.

It is needless to emphasize that a good and progressive 'democracy' calls for a well-informed and knowledge-based governmental intervention at the appropriate time in the 'Affairs of the Nation' be it relating to its industrial growth and economic progress, scientific and technological development, agriculture, alleviation of poverty or even political stability. While this canvas of far-flung activities, each apparently quite distinct from the other, is very vast, undoubtedly, simultaneous and comprehensive development of all these areas and many more is vital for the healthy growth of a nation. The task of making the right decision at the right time is understandably extremely difficult and can be achieved only through periodic reviews and adjustment of 'Policy decisions' to suit our domestic needs

keeping in view the changing global economic and political environment. I sincerely hope that the views expressed and the suggestions made in regard to only one small but vital area, viz. 'Technology development', will catalyse further discussions and debate and eventually provide a knowledge base to our policy-makers to make necessary corrective adjustments. If this limited objective is achieved through this article and 'Tomorrow's citizens' do not blame us for the path that we have chalked out for them, I shall consider the time that I have spent writing it, worth its while.

This article is primarily based on my three decades of experience in the fields of basic and applied research, technology development and production of reactive metals. Since my entire career so far has