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CORRESPONDENCE

Science education for the poor

The need for broadening the Science base in India, in order to tap talent from the entire population of the country so as to make the Indian scientists more competitive in the international arena has been emphasized (*Curr. Sci.*, 1995, **69**, 287). It is heartening to learn (*The Hindu*, August 21 and 29, 1996) that the Government proposes to start Residential Schools in 100 districts in the country in order to impart quality education to the poorest of the poor. This is very much required as there is little hope for poor children (who come through the midday meal programme) to become doctors, engineers and scientists if the current trend of commercialization of education continues.

The criteria for admissions to these Residential Schools should be different. The selectors should go to the elementary schools run in the respective areas to select the best students among the poorest of the poor. Remuneration of teachers in these new Residential Schools should be much higher than for those in other schools and they should not be allowed to give private tuition, which destroys the education system in this country. On the other hand, incentives should be provided for teachers who work hard to get the best out of their students. In addition, parents should be supported financially so that they do not take away their wards half way through.

I would urge the Government further to start 'National Science Universities' also for the poorest of the poor. One such 'elitist' university (on the IIT, IISc model) in each state, exclusively for the best among the students who come from the above mentioned Residential Schools, will be required to make them doctors, engineers and scientists. Again, remuneration of teachers of these National Science Universities should be much higher than those in other Universities so that the best will come forward to serve the poorest of the poor. Admissions to these National Science Universities at the research level can be made open to the best among all Indians. I believe that these measures, in addition to helping the poor, will also make Indian science highly competitive.

There is a growing feeling among the common public and the political leadership that the higher education and scientific research are toys of the rich. This is one of the reasons, for the present reluctance of Government to spend scarce resources on higher education. If the science leadership and the academies come forward to help the poorest of the poor, no Government will ignore higher education and science. I strongly believe that we still have leaders among us who will appreciate and come forward to implement these ideas as they will not like to miss a chance to become the 'messiahs' of the poor.

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RESEARCH NEWS

Vitamin A analogues and cancer

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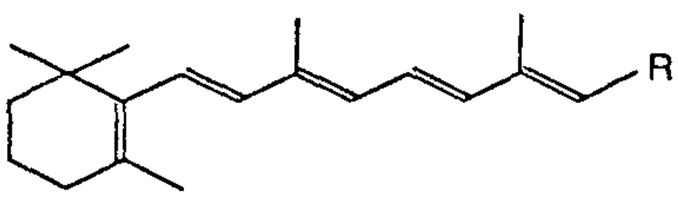
Vitamin A is known for its role in general growth and healthy eyes. Its deficiency in diet results in night blindness. Vitamin A is essential to fight against infectious diseases such as diseases of respiratory system and diarrhoea. In nature, it occurs in two forms, retinal and dehydroretinol. Retinol is vitamin A and retinal, an aldehyde of vitamin A, is derived from vitamin A by oxidation. The retinal differs in having one or more conjugated double bond and has approximately one-third the biological activity of retinol, i.e. vitamin A.

Majority of human cancers arise in epithelial tissues of lungs, bladder, breast, colon, pancreas, stomach, uterus, prostrate, etc. Retinoids which include retinol, retinal, retinoic acid, etc. are implicated in the maintenance of normal epithelial cell differentiation and are useful for the treatment of certain kinds of cancer, e.g. vitamin A can cure mouth cancer. Since carcinogenesis is characterized by abnor-



Retinol : R = CH_2OH
Retinal : R = CHO
Retinoic acid : R = COOH

mal cell differentiation, the primary need will be to use agents that can bring about normal cell differentiation. Retenoids, especially the naturals such as retinyl esters and others, can help in the prevention of cancer.

Lack of promising results by retinoids may be because these do not always reach potential sites in adequate concentrations. Because of fear of excessive storage of retinyl esters that may cause damage to the liver, there may be a failure in administration of appropriate doses. The all-*trans*-retinoic acid (ATRA), another retinoid, is used in the treatment of skin cancer and leukaemia, especially acute promyelolocytic leukaemia (APL)[1]. Indeed, this presents a breakthrough, although 13-*cis*-retinoic acid has been found to have a marked inhibitory effect on the development of both preneoplastic and neoplastic lesions of the bladder. Consequently, retenoids, the structural analogues of vitamin A represent a new class of compounds with remarkable therapeutic activities. It remains for the organic chemists to synthesize further structural variations of retinoid skeletons.

Recent studies[2] showed interesting results on the application of supplements of vitamin A and zinc. These give protection against stomach cancer. Studies conducted in China showed that the supplement can act as the anti-cancer agent. Philip Taylor, Chief of the Cancer Prevention Studies at the US National Cancer Institute in Bethesda, Maryland, confirmed usefulness of these supplements. The research study organized by Chinese and American researchers prescribed daily intake of one of the four combinations such as vitamin A and zinc; B vitamins such as riboflavin and niacin; vitamin C and molybdenum; and an anti-oxidant especially the cocktail of β-carotene (precursor of vitamin A), vitamin E and selenium. These researchers believe that vitamin A prevents cancer because it stops cell differentiation processing to a minimum and zinc added to vitamin A accelerates the cellular transport of vitamin A. However, vitamin A and zinc formulation is assumed to be the best. According to these workers, cancers of stomach can be reduced by two thirds.

The Harbin team found that arsenic compound in traditional Chinese medicine helped a complete remission in more than 70% of APL patients. Zhung reported[3] that the side-effects were almost nil and that if there is any toxic effect, it can greatly be minimized by intravenous administration of the drug. It is believed that arsenic trioxide works differently with ATRA. The mechanism awaits elucidation.

1. Mervis, Jeffrey, *Science*, 1996, **273**, 578.
2. Kolberg, Rubecca, *New Sci.*, 1993, 22 May, 7.
3. Ting-Dong, Zhung, *Science*, 1995, 17 Nov. 1144.

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Research Snippets (*edited by K. Manjula*)

A feast for the pharaoh

The art of producing beer and wines is said to be almost eight thousand years old. Ancient methods of preparation chiefly relied on exposing fruit juice and cereal extracts to air. Reports of the use of fermentation techniques during wine-making are said to date back to four thousand years ago in the Egyptian and the Babylonian civilizations. Artistic descriptions indicate that bread and beer were the staple food of the Egyptian civilization. Earlier documented evidence of this ancient culture indicates that coarsely milled wheat used for making bread was in fact well-kneaded but full of chaff and grit. Baked bread was sometimes crumbled and strained through sieves into vats with water to initiate the process of making beer (*Biotechnology of Malting and Brewing*, by J. S. Hough).

More direct evidence was further obtained from remains recovered from tombs and settlements dating throughout the Pharaonic period. Examination of such remains would provide reasonably authentic evidence as the Egyptian climate allowed for good preservation of the starch content of the food specimen. Earlier studies relied on the use of light microscopy of samples such as the pots wherein liquor was stored as well as food packed into Egyptian mummies for the next life. Results were often obscure and unreliable due to a poor resolution of the starch granules. A study conducted by Delwen Samuel (*Science* vol. 273, 26 July 1996) has interesting facts about how the ancient Egyptians baked their bread and brewed their beer. The study relied on the use of Scanning Electron Microscopy in order to systematically analyse desiccated loaves and cereal residues obtained from a site where Egyptian workmen built tombs in the Valley of Kings and Queens. The focus of attention was analysing the physical properties of starch granules that are known to vary according to the method used during the food processing. When starch (a polymer of glucose units linked together through glycosidic bonds) is heated in water, the starch granules swell, fold and merge. Depending on the water content of the food sample, the starch granules either remain discrete or fuse together creating hazy boundaries (as revealed through an SEM). The study has revealed that the microstructure of Egyptian bread resembled that of the modern bread with some loaves even leavened by the use of yeast. Contrary to the older belief, brewing was done not by a crude method but was in actuality a two-step process. Heated and malted cereal grains were mixed with unheated and sprouted grains, decanted and fermented to produce Egyptian beer. Cleopatra obviously wined and dined her guests in style!