

Herbal medicines – some more reports

Several problems associated with the use of Herbal Medicines (HM) were discussed earlier in this column. Presence of toxic materials in HM, quantitative variation of the constituents from batch to batch of the plant products and alleged admixing of allopathic medicines with the herbal formulations by the manufacturers have raised serious concern among the medical scientists about safety of the patients^{1,2}. A couple of subsequently published reports, highlighted here, reveal some other difficulties in the safe use of HM.

A herbal stimulant named Ma Huang claimed to be a mood enhancer and an aphrodisiac has recently been attributed to the death of 15 persons in the US³. In another case a person, who had no history of mental illness, became paranoid after taking Ma Huang for 10 days and jumped from an upstairs window with the fear that he would be killed by some supposed attackers. Fortunately he sustained only minor injuries. The formulation is known to contain ephedrine which is used as a nasal decongestant and bron-

chodilator but can cause psychosis among other complications when used in overdose. There was no mention of ephedrine in the leaflet of the product. On being contacted, the manufacturers failed to answer how much ephedrine was present per tablet⁴. This lack of information in the product literature of HM is a major problem for the patients throughout the world. Allured by the advertisements in the public media (as it happened in the second case) they buy and take HM and sometimes incur a lot of additional problems.

There is also reason to be worried about the microbiological and parasitological quality of the HM. A couple of months ago, some researchers detected harmful parasites in a sample of fish used to give an Ayurvedic medicine to thousands of asthmatics every year on an auspicious day of June⁵.

It must be emphasized that nowhere in the world do the scientists deny the immense potential of the HM to complement the western medicines, but the ques-

tion of safety of the patients cannot be relegated to the background. In this context it is worthwhile to note the comments of a reviewer 'A hundred years ago a pharmacist might sell you opium mixture, very likely adulterated. Now all over-the-counter medicines are regulated, and it is time "alternative" ones were as well'⁶.

1. Chattopadhyay, M. K., *Curr. Sci.*, 1996, **71**, 5.
2. Bhattacharyya, P. C., *Curr. Sci.*, 1996, **71**, 341.
3. Josefson, D., *Br. Med. J.*, 1996, **312**, 1441.
4. Doyle, H. and Kargin, M., *Br. Med. J.*, 1996, **313**, 756.
5. Madhavi, R., Jhansilakshmi, K. and Muruges, M., *Curr. Sci.*, 1996, **70**, 350–351.
6. Savage, A., *Br. Med. J.*, 1993, **307**, 332.

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Biobatteries

The report on 'Biobatteries' was not properly vetted by *Current Science* before being published (*Curr. Sci.*, 1996, **71**, 92–93). To say the least, there is little or no novelty in that report, the 'biobattery' developed with fruit juices being just a version of the simple Daniel cell. The extensive references to biomass conversions included in the report notwithstanding, one can easily see, from an elementary knowledge of how electrochemical cells work, from what can be gathered from 'How Things Work' encyclopaedias or even from secondary school science classes, that the electric energy is drawn, not from the 'juices' through some direct biochemical process, but from zinc, when it is corroded by those juices, the energy having been put into the zinc, in the first place, when it

was smelted from its ore by reduction to the metal stage through a high-energy metallurgical process*.

Years ago, when the transistor radio was new, it was demonstrated that one such radio, equipped with earphones, can be operated by means of a 'cell' made of copper and zinc American one-cent coins separated by a piece of newspaper moistened with saliva (1943 one-cent coins were minted out of zinc, instead out of the usual copper, in order to conserve the latter for the 'war effort'; the few copper 'pennies' that were minted in 1943 are now numismatic collector's items, worth millions of dollars, I am told!). The principle was, of course, that of the Daniel cell – as zinc ionizes into the 'juice' or saliva (abundantly available in Indian streets!), the released electrons flow through the wire or connected apparatus from the cathode (zinc) to the anode (copper). In modern 'lithium batteries' lithium metal serves, instead of zinc. The function of the 'juice' is to act as an ion transport medium with an

'overvoltage' sufficient to prevent the electrons from engaging in a direct reaction near the zinc, without producing a 'current' said to 'flow' from the anode to the cathode. The reaction ensuing the arrival of the electrons at the anode is one of producing hydrogen by a process of reduction. The current tends to fall off, however, when the copper gets covered over by a film of gaseous hydrogen. This is the so-called 'polarization' of the simple Daniel cell. No wonder, then, the authors find it necessary to clean the electrodes (especially the copper anode) 'frequently' in order to restore the potential to the 'fresh' value (incidentally, what is the meaning of values of current (in mA) given in the tables? Were they measured with the electrodes 'shorted'?).

'Polarization' is avoided by oxidizing off the hydrogen. In a Leclanche cell, where the 'electrolyte' is moist ammonium chloride, the oxidizing agent is manganese dioxide packed around the anode, a graphitized carbon rod as in a

*These comments apply also to a 'battery' using slurry from a biogas generator, described by the CIAE, Bhopal; see Mital, K. M., *Biogas Systems – Principles and Applications*, New Age, New Delhi, 1996, pp. 285–286.

torch cell you throw away when once the zinc casing has mostly dissolved away.

I am not certain of the ergonomics of the 'biobattery' but it would really have been impressive if the authors had considered the possibility of methane being cogenerated with the hydrogen near the anode and managed to demonstrate either that it happens or that it does not. If methane is formed at all under the relatively aerobic conditions of the 'biobattery', it would have been an 'advance' on (not really a mimic of) the as yet poorly understood process of biomethanation which takes place only under the exclusively anaerobic conditions of the rumen (of cows, sane or insane) or biogas digester. Or, there would have been real novelty to the authors' efforts had their aim been to isolate and immobilize an

oxidizing enzyme from a natural source, one that utilizes oxygen from the air to oxidize the hydrogen produced near the anode. Commercially viable or not, replacing manganese dioxide by such an enzyme for overcoming 'polarization' would have been a real breakthrough for developing a 'biobattery'. Maybe, the electric eel has all the answers – it utilizes energy from combining what it ate of the prey that it has stunned with an electric shock with the oxygen dissolved in seawater, having met the challenge of inventing a true 'biobattery' millions of years ago!

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This is with reference to the article 'Biobatteries to utilize bioenergy from fruit and vegetable wastes'. The item is misleading because the source of electrical energy in these batteries is the dissolution of Zn. The standard potential for the Cu/Zn couple is 1.1 V and it is not surprising that when these two electrodes are immersed in a paste of vegetable or fruit waste, a current is observed. The readers of *Current Science* deserve better.

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NEWS

R&D efforts in industry – National awards for 1996 presented

In order to provide recognition to the efforts of industry towards innovative research and technological development, the National Awards for R&D efforts in industry were instituted in 1987 by the Department of Scientific & Industrial Research (DSIR). These awards are in the form of silver shields and are presented along with citations at the inaugural session of the 'National Conference on in-house R&D in Industry', held annually by DSIR.

Professor Yogendra Alagh, Union Minister of State for Science & Technology presented the shields on 10 December 1996 in New Delhi to the

following seven winners of awards for 1996:

- **Armour Polymers Limited, Mumbai**, for the development and commercialization of the amoxidation process for the manufacture of cyano pyridines.
- **Hetero Drugs Ltd., Hyderabad**, for overall bulk drugs and intermediates.
- **Lamco Lightning Arrester Mfg. Company Pvt. Ltd., Hyderabad**, for the development and manufacture of lightning arrester disconnectors.
- **Patwa Kinarivala Electronics Ltd., Vadodara**, for the development of a

range of instruments and electronic control systems for the textile industry.

- **Titan Industries Limited, Hosur**, for the design, development and commercialization of ultra-thin quartz analog watch movements.
- **Ankur Seeds Pvt. Ltd., Nagpur**, for breeding superior hybrids of cotton, okra, chilli, brinjal, cucurbits and sunflower.
- **Jain Irrigation Systems Ltd., Jalgaon**, for fully absorbing technology, imported for micro-irrigation and sprinkler systems, and improving it by their own R&D.

RESEARCH NEWS

Vaccine production in transgenic plants

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The development of novel techniques of tissue culture and molecular biology to genetically transform plant species has revolutionized plant biology, and there is an enormous interest to design and produce plant species with desirable characteristics such as insect resistance, disease resistance, herbicide tolerance and delayed fruit ripening. The notable achievements

in these areas led to explore the possibilities of employing transgenic plants with modified biosynthetic potential for new products¹. Biologically active peptides and proteins have many potential pharmaceutical applications including use as vaccines, immuno-modulators, growth factors, hormones, blood proteins and enzymes². There has been a recent interest

in this direction in producing functionally active proteins, peptides of medical importance, in transgenic plants. On a global scenario, the developing countries are often the target of several infectious diseases. Preventive medicine (for example, vaccines) has proceeded rapidly in the last decade as biotechnology has been applied in several areas. These medical