

Ethnobotany and the Search for New Drugs (Ciba Foundation Symposium 185, Symposium on Ethnobotany and the Search for New Drugs, Fortaleza, Brazil, 30 November to 2 December 1993). Derek J. Chadwick and Joan Marsh, eds. John Wiley & Sons, Chichester, UK, 1994. pp. 10 + 280. Price: £47.50, \$76 00

Ever since the English physician William Withering brought *Digitalis purpurea*, till then part of folk medicine, into Western medicine, plant-based medicines have played a major role in organized healthcare delivery throughout the world. A major step forward in the ascent of plant-based medicines was when, in the last century, Bayer, the German chemical major, decided to synthesize and mass-produce aspirin – a slightly modified form of a naturally occurring compound isolated from willow bark. Aspirin turned out to be the largest sold drug ever! Today more than 25% of prescription drugs issued in North America contain bioactive compounds that are derived from or modelled after plant natural products. Norman Farnsworth of the College of Pharmacy of the University of Illinois at Chicago has identified 119 secondary metabolites isolated from higher plants that are being used globally as drugs. But for awhile, especially after the invention of antibiotics and the development of sophisticated synthetic methods, drug companies relegated the development of plant-based drugs to the backburner. One reason for this temporary disenchantment with plant-based medicines could be the enormous costs involved in testing thousands of plants at random. For instance, the National Cancer Institute of the United States used this approach from the mid-1950s until 1982. The actual yield of this programme is estimated to be one marketable anticancer drug per 8000 plants tested! In the meanwhile drug companies also found the synthetic route – wherein hundreds of compounds are synthesized and tested – to be unaffordable.

It is at this juncture that the enormous potential of ethnobotany came to be recognized. The idea is simple. Instead of testing plants at random, only those plants which are being used by traditional societies to cure their sick will be

tested. In other words, one should try to take advantage of folk knowledge. That involves cross-cultural transfer of knowledge. The actual transfer of the plant material from its natural habitat to the drug companies involves transfer of valuable resources. These lead to questions of intellectual property rights, patents and adequate compensation.

Thus, ethnobotany is not mere botany; it is about people, it is about cultures, it is about biodiversity, it is about the possible threats of deforestation, acculturation and wiping out of cultures and natural resources, and it is about multimillion dollar drug business. Above all, it cannot wait. No one knows how long the plants and the cultures which know about their efficacies will survive.

I am sure, all these concerns were uppermost in the mind of Paul Alan Cox of Brigham Young University when he suggested the holding of this symposium to the Ciba Foundation. If the resulting book is any indication, the conference must have been organized very well. Some of the leading workers in the field have contributed excellent papers.

The book opens with a brief introduction by Ghilleen Prance, Chairman of the Royal Botanical Gardens, Kew. He set the tone for the conference by drawing attention to the interdisciplinary nature of the field, and asking 'What have indigenous people gained from the use of their knowledge by Western culture?' He also drew attention to the problem of translation between the categories (of ailments) adopted by the traditional societies and the categories used in modern medicine. This was followed by 15 presentations; it was rather unfortunate that Richard Evans Schultes, one of the world's leading ethnobotanists, could not make it to the conference. However, his brief but informative paper on Amazonian ethnobotany was circulated and discussed at the conference. Schultes emphasizes the need to intensify ethnobotanical field research to be able to win the race against mindless devastation and destruction of rain forests and acculturation. He ends his paper with the plea that 'all scientists involved make every effort possible to encourage the training of more ethnobotanists and ethnopharmacologists willing to carry on field work with people who still have the knowledge of plants and their prop-

erties which they have inherited from generations unnumbered'.

Michael Balick, a student of Schultes, observes that the most valuable contributions of ethnobotany to drug development can come from small and tightly focused programmes, especially with plants used to treat hepatitis, diabetes, diarrhoea, gastrointestinal problems, skin infections, fungi and wounds. In his opinion, it is essential to combine medical and ethnobotanical skills to obtain a proper understanding of plant use in terms of both Western science and traditional beliefs. As we do not know the chemical composition and the full medicinal potential of 99.5% of the plant kingdom, Balick would like drug companies to continue the random approach as well. Indeed, the Institute of Economic Botany, of which Balick is the director, is collaborating with Pfizer in exploring the plant wealth of forests in the United States. Paul Cox, another student of Schultes, has looked at the strengths and limitations of the ethnobotanical approach to drug discovery. He lists more than 50 drugs discovered from ethnobotanical leads. He points out that 72% of every research dollar spent in the Western world is spent on cardiovascular illness, neoplasms, nervous system's disorders and microbial diseases. But very few indigenous cultures have recognized cancer and leukaemia and, therefore, the success rate of ethnobotanical route in the discovery of cancer drugs may not be high. On the other hand, the success rate with regard to gastrointestinal disorders, the most frequent type of disease in Third World countries, may be high.

While emphasizing the need to evaluate plants used as traditional medicines, because more than 3300 million people in the less developed countries use medicinal plants on a regular basis, Norman Farnsworth draws attention to the difficulties encountered in ethnopharmacological work. He warns that unless ethnomedical information is collected in great detail and accurately, it will be no better than random selection of plants followed by targeted biological screening. He pleads for more well-trained ethnobotanists. Farnsworth also gives a brief account of the NAPRALERT database, which provides information on the pharmacological effects of extracts of living

organisms, ethnomedical information on the use of plants, and the biological effects of secondary metabolites.

Walter Lewis and Elvin-Lewis explore the basic, quantitative and experimental research phases of ethnobotany with special reference to the medicinal plants of South America. Search for new drugs cannot succeed unless all the three phases are taken care of. Elaine Elisabetsky and Darrel Posey look at the development of plant-based antiviral compounds, particularly for the treatment of gastrointestinal disorders, based on the experience and practices of Kayapó Indians of Brazil. Another paper based on Brazilian plants, by Craveiro *et al*, deals with natural products' chemistry. It also describes the Living Pharmacy Programme, under which the local people are taught to cultivate and use medicinal plants correctly. Maurice Iwu, Xavier Lozoya and S. K. Jain have reviewed the current status of African, Mexican and Indian ethnobotanical research, respectively. Iwu has listed several Nigerian plants and their medicinal use; Jain has given lists of Indian plants useful in the treatment of intestinal, joint, liver and skin diseases. Lozoya points out that the lack of clinical studies of plant remedies traditionally used in less developed countries is one reason for the failure to come up with new herbal drugs. Could it be that the Western healers and researchers are threatened by the success of the native epistemology which could, unaided by the tools of Western science, discover and retain the knowledge of plant-based cures for millennia? Does the West suffer from a cultural handicap? In this respect, Asian researchers have an advantage over Western researchers, feels Lozoya.

Pei-Gen Xiao gives an account of ethnopharmacology and new drug development in China. There are 7295 species of plants used medicinally in China, and plant-derived drugs make up 45% of the market. Gordon Cragg and coworkers describe the experience of the US National Cancer Institute (NCI) over the past three decades and more in ethnobotany and drug discovery. A welcome feature is a discussion on intellectual property rights, international collaboration and compensation. NCI collects material from foreign institutions such as the Bogor Herbarium in Indo-

nesia and the Botany Department of the Philippines National Museum.

Two researchers from Shaman Pharmaceuticals, Steven King and Michael Tempesta, describe the company's experience in drug development based on leads obtained from native healers. They have a good team of interviewers assisted by competent translators. Shaman's is one major success story among drug companies using the ethnobotanical route to drug discovery. They already have two drugs, Provir for respiratory viral infections and Virend for herpes, in clinical trials. More are expected. Shaman has a scheme of compensating the native people and communities providing the knowledge.

John Barton, who teaches law relating to high technology at Stanford, discusses the intellectual property rights issues involved in ethnobotany and its use in drug development and manufacture. He pins his hope on nongovernmental organizations to develop a uniform agreement on the relative rights of indigenous peoples and of their governments. Gary Martin looks at the prospects of judicious exploitation of plant resources without harming conservation and biodiversity as well as how ethnobotanists working in the field can help in community development and sustainable plant use. Berlin and Berlin raise questions pertaining to preservation, codification and promotion of traditional cultures and knowledge systems, and returns to the native communities. They narrate their experience in Mexico working with the Highland Mayapeople. The book ends with a brief but perceptive conclusion by Ghilleen Prance.

This is an excellent book. It deals with a topic of great current interest and urgency and it has brought together the views and experiences of many of the leading scholars in the field drawn from North America, Europe, Asia, Africa and Latin America. It covers all aspects comprehensively. The conference format has contributed a great deal, as is evidenced by the enormous amount of useful information that has come up in the discussions following each presentation. Indeed, the book would have lost considerably if the discussions were not included. The Ciba Foundation and John Wiley & Sons deserve full marks.

The only flaw in this well-produced book is that some pages shown on the contents page do not match with the beginning pages of the articles.

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Environmental Health Perspective; Supplements: Molecular Mechanisms of Metal Toxicity and Carcinogenicity. National Institute of Health, USA. 1994, vol. 102.

Environment Health Perspective is regularly published by National Institute of Environmental Health Sciences, National Institute of Health, USA. This journal regularly publishes research papers, review articles and sometimes status report in certain areas related to environmental health. It also publishes supplements containing lead articles on research work presented at international meetings.

This volume of *Environmental Health Perspective, Supplements* (Vol. 102, Supplement 3, September 1994) contains selected papers from the Second International Meeting on Molecular Mechanisms of Metal Toxicity and Carcinogenicity held in Madonna di Campiglio, Italy 10–17 January 1993.

The field of metal carcinogenesis and metal toxicology is changing at a rapid pace, so much so that it is now being looked into not only at the organism level but also at the molecular level. Selected papers published in this volume deal with several important molecular aspects of toxicity and carcinogenicity, such as oxidative and free-radical effects, genotoxicity, mechanism of resistance, carcinogenetic process, relationship between carcinogenesis and metallothionein, cellular and molecular aspects of toxicity, etc.

The articles of this volume contain interesting data on chromium-cadmium-, nickel- and arsenic-induced carcinogenesis. Data on chromate-induced DNA strand breaks, Fenton-reagent-induced generation, powerful oxidants, and evidences for radical species as intermediates in cadmium/zinc-