The Role of Medicine in Conservation and the Threat to Biodiversity in Madagascar

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Medicine should take an active role in measures to help save the fast disappearing biodiversity in the tropical rainforests of the world. This can be implemented by combining the strongest features of "orthodox" medicine including health education, vaccination programmes, and nutrition -- with traditional healing methods based on medicinal plants. It is necessary to remove the negative attitudes toward traditional medicine held by many health professionals. Research should be directed toward studying plant medicines before the forests vanish and the world loses a potential treasure chest. [M&GS 1995:243-247]

[Editor's Note: The Democratic Republic of Madagascar, also known as the Repoblika Demokratika Malagasy, is the fourth largest island in the world, located in the Indian Ocean off the southeast coast of Africa.]

The battle to save the enormous biodiversity in the world's tropical rain forests is becoming a race against time. Not only are the forests important in climatic control [1,2,3], but they hold a vast medicinal treasure chest waiting to be opened. Medicine has an ill-defined role in conservation and many projects either ignore or place little emphasis on the importance of conserving biodiversity, or face enormous political and governmental problems. The dismissive attitudes of most orthodox doctors in considering the uses of plant medicine are disappointing. Attitudes are changing, however, and some doctors are accepting the premise that plant medicine has an important role in managing disease and can be used in conjunction with orthodox medicine.

The use of plants for medicinal purposes is known from Chinese records of 5000 years ago, but only since the dawn of organic chemistry in the 19th century have plants been analysed for their compounds and modes of action. Historically, medicinal plants were prescribed by shamans who held great powers in the community. The Greeks had their own "Poppy Goddess" in celebration of the powerful effects of the opium poppy (papaver somniferum), which carried through into the decoration of Greek literature and art. In early practice, heart-shaped leaves were given for heart problems and yellow leaves for jaundice. Therapeutic trial and error over many generations identified certain parts of plants that were effective for different illnesses, some of which are used today on an enormous scale (e.g., the trembling leaves of the white willow (salix alba) were

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given to those with a fever, these being the source of salicin, a compound similar to salicylic acid from meadow sweet (filipendula ulmaria) [4]).

Twenty-five percent of pharmaceutical products today are plant extracts such as quinine from yellow cinchona (cinchona ledgeriana) of the Andes, vincristin and vinblastin from the rosy periwinkle (catharanthus roseus) of Madagascar, pilocarpine from the jaborandi tree, cortisone from the dioscorea species in Mexico, colchicine from meadow saffron (colchium autumnale) and numerous others [5,6,7,8,9] Some compounds, such as aspirin, are now synthesised for greater therapeutic effect and standardisation, but others still come from natural sources, such as digitalis, from the foxglove (digitalis purpurea). Curare (chondrodendron and strychnos) is also considered better in its natural form [10].

Madagascar: Biological and Social Evolution

One very important area in the world, where there is an enormous diversity of unique plant life, much of it under threat, is Madagascar. This vast island off the southeastern coast of Africa has a population of about thirteen million, with 43.3% under fifteen years of age [11]. Madagascar has the unenviable reputation of being ranked 127th in the world based on gross national product and, with a growth rate of 3% a year, the population is on a course to double by the year 2015 [11]. Having separated from the African mainland during the age of the dinosaurs 165 million years ago, this land mass, the fourth largest island in the world, underwent a separate evolutionary route to produce probably the richest area of biodiversity in the world. Ninety percent of Madagascar's fauna, and 75% of its estimated 12,000 native plant species (England, by contrast, has only 1,750 native plant species), are believed to be endemic [12]. Madagascar's rainforests are continually revealing important new genera and species [14,15]. Therefore, since only 15 25% of its primary rainforest areas remain undestroyed [13], the island nation has become a top priority for conservation organisations.

Enormous Riches, Stark Poverty

Living in the midst of this biological wealth, however, is a human population beset with poverty and illness, yet rooted in a traditional culture that in many ways serves them better than the Western model that is being imposed on them. Before the introduction of European medicine, chiefly by the London Missionary Society at the start of the l9th century, the tribal inhabitants of Madagascar relied on divine healers who had a deep knowledge of Malagasy plant medicine (tambavy). Although tambavy is still relied on in many rural areas, the pressure of "slash and burn" nomadic subsistence farming is destroying the vital medicinal reserves in this ecosystem.

For sixteen years Madagascar was ruled by a corrupt government that drove the economy into a spiral decline characterized by the collapse of the free health system, social breakdown, mounting foreign debt, outbreaks of famine, and uncontrolled forest destruction. Among the people there was an erosion of self worth and responsibility and a spread of discontent leading to a revolutionary movement in 1991 that successfully removed the country's dictator. In 1993 a new democratic president, Albert Zafy, was elected and now there is an air of some optimism.

Health Care in Shambles

At the present time, however, hospitals lack almost everything. Rusty beds with no mattresses lie on ripped linoleum floors surrounded by damp crumbling walls. Patient visits are infrequent, doctors often do not turn up for work, and morale is very low. There are many good reasons why people do not visit Malagasy hospitals:

* Hospitals are too few and too far away from most people;
* Communication and transportation are exceptionally bad, with roads cut off half the year due to savage rains and cyclones;
* Medication is usually not available or is too expensive;
* People do not understand the help that is available (eg. cataract surgery) and they fear moving to an unknown place;
* Leaving work and family for a hospital stay is difficult;
* Villagers choose to rely on divine healers and local plant medicines.

As a result, dying people lie on palm mats without medication due to lack of money; wounds are stitched with fishing line and without anaesthesia; and there is widespread theft of medication that is then sold on the black market. The Malagasy patient typically goes to the pharmacy with a list of perhaps four prescription medications and walks out with only a few tablets of the ones he or she can afford. As always the poor suffer the most.

Eighty four percent of Malagasy families are agriculturally based and family size often numbers 8-14 children (the author encountered one man with 120 children from 11 wives). Malnutrition is caused more by inappropriate diets than by foods being too

expensive: some people eat little more than plain rice or manioc three times a day. Although many foods that today form the base of world diets originally came from the forests (e.g., potatoes from the Andes, maize from South America, and sugar from Asia), many people rely on foods poor in nutrition, such as manioc, which has little protein and vitamin content. Plants such as astrocaryum vulgare, an Amazon palm fruit, contain three times more vitamin A than is found in carrots, and could be used in the fight against xerophthalmia, an eye disease common in Madagascar.

Pressures on Tropical Forests

Traditional plant medicine often gets bad press, yet neither traditional nor "orthodox" medicine can claim to fight all illness effectively and no doctor knows all the side effects of the drugs he or she prescribes. As it is, 50% of pharmaceutical products are plant extracts, with about 25% coming from tropical zones all over the world. As resistance to drug therapies mounts, the importance of preserving the diverse genetic stocks of the rainforests cannot be overemphasised.

There are medicinal plant products for malaria, gastrointestinal disorders, and bronchial infections, which are the major causes of mortality in Madagascar. Schistosomiasis and cysticercosis are also problems for which there are local plant remedies. Medicinal plants are found mainly in areas of primary or degraded forest, and are taken as a tea or juice pounded from the leaves, stems, roots or flowers, or are applied directly to the problem area.

The tropical forests of the world are under immense pressure from expanding populations that encroach onto newly cleared and marginally fertile soils for cattle grazing and agricultural land. Deforestation is caused in part by burning by nomadic subsistence farmers and by the extraction of wood for fuel, construction, export, and cultural and artisanal activities. Many rare and beautiful plants are removed for ornamental purposes.

Indigenous peoples, however, are by no measure solely, or even predominantly, responsible for deforestation or the loss of biodiversity. Approximately 1.2 billion people who live in the north -- one fifth of the world population -- consume 85% of all the world's wood and 70% of the world's energy. The excessive materialistic way of life of the few in the northern hemisphere far outweighs the environmental damage done by those in the southern hemisphere [16].

Producing Medicinal Plants and Sustainable Incomes

Nevertheless, protecting the forests is exceedingly difficult. The introduction of foreign concepts of parks, with boundary areas where one can and cannot go, must be strange, confusing, and often offensive to people who have successfully lived in balance with the land for many generations and now are under pressure to change. Alternative ways of addressing the problem of deforestation include "ecotourism," which attempts to integrate conservation with sustainable development [17], and "ecological economics," the sustainability of the environment and its long term productivity [18,19,20]. In order for these approaches to work, governments must be firm and not guided by greed. This was clearly illustrated recently in Madagascar by the cancellation of the protective status of a park in the north of the country in order to create a palm oil plantation.

The forests will only be able to survive if they produce a sustainable income that gets to the local inhabitants. The $180 million business derived from the rosy periwinkle, which is cultivated to extract the drug vincristin, is of little benefit to Madagascar [21] and traditional plant healers fear loss of their wisdom to pharmaceutical companies that may return the distilled product in expensive pill form. As the logical, scientific reasoning of "orthodox" medicine swamps Madagascar, these healers have now become endangered themselves. This great art, passed down verbally through successive generations, is threatened along with the medicinal plants on which it is based. In trying to integrate medicine with conservation, it is vitally important for all agencies involved to work together and not in fragmented ways that can create problems elsewhere.

Plants and their diverse functions are often taken for granted. The world has some 380,000 plant species of which 10,000 are used as food, drinks, or flavourings; only 150 are cultivated to any extent and 90% of world food needs comes from only 20 plants -- wheat, maize, and rice account for more than 50% of the total [4]. Concentrating on so few domestic crops means that plant diseases can cause devastating effects, yet the forests hold enormous genetic reserves with natural resistance [22,23]. Zea diploperenius -- a wild maize from Mexico -- has inbuilt resistance to five of the seven principle pests that affect maize crops [24]. Other plants have nutritional and ecological value: the Amazonian palm fruit has already been mentioned; the Babassu palm (orbignya phalerata) from the Amazon has the highest yield of vegetable oil [25] and there is even potential for an alter-

native energy source in plants such as copaifera langsdorfi, another Amazonian plant that produces a form of petrol [27]. Madagascar is home to 50% of the world's flowering plant families, of which only 1% have been studied by orthodox medicine [28]. As a television commentator said recently, "If the conservationists cannot succeed in a place as special as this, there is little hope for the rest of the world" [29]. The problem is that so many species are under threat and some are so specialised as to inhabit only a certain side of a particular hill slope [13]. We have little knowledge of what we have lost already and what we are losing daily.

Supplying medicines to villages in sensitive ecological areas can help support inhabitants who need incentives to undertake other sustainable development projects. Apart from education and sanitation, the practical application of other medical regimens such as mass vaccination is difficult -- often populations are spread out over wide areas involving many hard days of walking, some vaccines need to be kept cool for stability, and more than one dose must usually be given for a suitable response. If any medication is available, it may be too expensive for too many people. Among the enormous benefits of traditional medicine are that it is cheap, readily available, and part of the culture.

Combining Traditional and Orthodox Approaches to Health Care

The establishment of combined clinics where the patient has the opportunity to consult both traditional and orthodox doctors is occurring experimentally in countries such as Madagascar as a means of promoting conservation [28]. If the inhabitants can see and believe that their local plant medicine has a role in working with "orthodox" medicine rather than being superseded by it, they may realise that these valuable plant resources should be preserved for future generations. Some of the plants will have unwanted side effects despite having been tested over many generations, but rather than making this a reason for not using them and watching the forests vanish, their use and study should be encouraged in these combined clinics where the two healing approaches can complement each other. This will help remove the patronizing attitude that regards traditional healers as underqualified and will simultaneously encourage forest preservation.

The role of the local inhabitants in realising the potential benefits of medicinal plants is crucial to conserving the vast and diverse riches of the forest. Domesticating the valuable plants, breeding high yield varieties, and preserving genetic stocks in strictly managed reserves are partial measures. They must be integrated with projects that improve the economic situation for the local inhabitants or the rainforest will continue to be cleared. Rather than tearing plants up in order to use their roots, research into those parts of the plant that are active, such as the leaves or the sap, might lead to more sustainable extraction methods. Some times only the cocktail of plant substances seems to have an action: cryptolepis sanguino lenta from Ghana, for example, has antibacterial properties when used in its natural form, while extracted breakdown products have appeared inactive [10]. Active products need to be identified and the safest way of using them worked out. Screening those plants that are already used by traditional healers yields a far higher identification of active compounds compared with studies done randomly [28].

Medicine does have a role in conservation and it is up to the medical profession to realise the benefits and to act for our future survival. ❧

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