

Ethical and Environmental Issues in Bioprospecting for Drugs through Traditional Medicine: The Case for Swaziland

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ABSTRACT

Traditional medicine is very popular in Swaziland as in many other developing countries. Plant materials constitute the main components of the medicine. There is a great pressure on the flora because of the unsustainable exploitation of the bioresources through herbal medicine. Many of the drugs used in orthodox medicine have their origin from plants and a large percentage of these phytomedicines were developed with lead from traditional medicine. The prospect of further development through this route is very high. However, there are some ethical issues inherent in traditional medicine and the search for drugs through the ethnomedical route. Apart from the destruction of bioresources, there are some pertinent ethical issues which should be addressed: Traditional Medical Practitioners (TMPs) have no empirical data to substantiate their claim for efficacy and safety of their products, therefore, the sanctity of life is compromised; in some countries, for example Swaziland, there is no regulating body controlling traditional medicine; in many instances a single traditional remedy is claimed to cure many unrelated diseases; morbidity arising from the use of herbal medicine is unknown; bioprospecting through soliciting information from the TMPs amounts to endorsing the use of humans as guinea pigs for experimentation which is unethical, to say the least; rituals and magical practices which may involve the use of human parts and the exploitation of custodians of indigenous knowledge by those employing indigenous knowledge for economic benefit. This review discusses how these pertinent issues could be addressed through legislation and collaborative efforts of all stakeholders.

Keywords: benefit sharing, conservation, herbalism, phytotherapy, safety

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INTRODUCTION

Three key issues in connection with traditional medical practice are discernable from the title of this review; namely: ethics, environment, and biodiversity prospecting for drugs. These issues are discussed with special emphasis on the experience in Swaziland as an example of what occurs in many developing nations in Africa. Both quantitative and qualitative primary and secondary data were collected from various sources most especially from ethnomedical surveys carried out in Swaziland (Adeniji *et al.* 2000; Amusan *et al.* 2000, 2002, 2004, 2005a, 2005b, 2007). The purpose of this review is to raise public awareness of some pertinent issues in traditional medicine and the search for drugs through it so that the issues may be addressed for improvement in the health delivery system.

TRADITIONAL MEDICINE

There are several definitions used in literature to describe traditional medicine. A comprehensive definition given by

Maganu (2007) states as follows: "Traditional medicine is the sum total of the knowledge, skills, and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement, or treatment of physical and mental illness." The definition by Sofowora (1982) incorporates the fact that for Africa, one must bear in mind that nature includes the material world, the sociological environment, whether living or dead and the metaphysical forces of the universe. Helwig (2005) emphasises the spiritual aspect of traditional medicine in Africa by defining the practice as a combination of herbalism and African spirituality. The World Health Organisation (WHO) refers to traditional medicine as health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being (WHO 2003). Traditional medicine is, therefore, the way of diagnosing and treating diseases based on culture, customs and beliefs that are peculiar to a group

of people in a particular place or region. The practice in Swaziland is clouded with a lot of secrecy, myths and metaphysical powers, and is often based on oral tradition (Amusan 2002). In traditional medicine, a human being is viewed as an integral part of nature and harmonious relationship with the rest of nature is seen as essential for good health. State of illness is believed to be caused by disharmony between the sufferer, and his spiritual and social world (Makhubu 1978; Sofowora 1982; Williamson *et al.* 1996).

It is believed that diseases are caused by supernatural forces arising from displeasure of ancestral gods, evil spirits, witchcraft, and effect of spirit possession or the intrusion of a foreign object into the body. Because of the belief that the cause of a disease may not be organic but supernatural, many of the concepts, rituals and practices involved in traditional medicine cannot be explained in scientific terms and can only be understood in the cultural setting of the practitioners (Makhubu 1978; Williamson *et al.* 1996).

The above definitions are all embracing and they incorporate all facets of traditional medicine and its practitioners. They also emphasise the holistic approach of traditional medicine which treats the whole person, including physical, social and psychological problems. This holistic approach to health views the body, mind and soul as an indivisible whole connected to the social and physical environment and to the spiritual world. It is therefore not only the symptoms of the diseases that are taken into account in traditional medicine, but also psychological and sociological factors. Traditional medicine is very much linked to cultural beliefs; it is an integral part of people's lives.

Plants and other materials obtained from the environment that are used for preparing remedies for treatment in traditional medical practice are not selected on the basis of their chemical constituents but on the basis of their perceived ability to restore harmony within the cultural beliefs. The restoration of harmony between a patient and his/her spiritual and social worlds through traditional medicine is another reason why treatment by traditional medicine is said to be holistic (Williamson *et al.* 1996). The holistic nature and culture-based approach of traditional health care is an important aspect of the practice, and sets it apart from conventional western approaches. Traditional medicine and adaptations of it are often referred to in the western world as indigenous, herbal, folk, complementary or alternative medicine.

Popularity of traditional medicine

Traditional knowledge has been utilised widely for the exploitation of natural resources for health care in Swaziland since time immemorial. This practice is not peculiar to Swaziland; before the advent of modern drugs, people of other cultures also used indigenous knowledge for the exploitation of natural resources in their local environment for medical care. It is the plant genetic resources that are used mostly (Amusan *et al.* 2002, 2005a).

Generally there is an upsurge in the use of herbal medicine globally. This is because of the emergence of drug-resistant pathogens that have been found very difficult to eradicate with known conventional drugs. Secondly, the global economic downturn has compelled people to look inward and find resources from their immediate environment for daily sustenance. About 120 plant-derived drugs are used in orthodox medicine and it is estimated that 74% of these phytomedicines were developed from traditional herbal medicines or knowledge held by indigenous people (Mugabe 1999; Newman *et al.* 2000). About 25% of drugs prescribed in orthodox medical practice in industrialised countries originated from plants (Newman *et al.* 2000). In the USA around 34% of the population used alternative therapies or complementary medicine based on herbal remedies in 1990; the percentage rose to 42% in 1997 (Eisenberg *et al.* 1998). Herbal medicine is becoming a big business in Europe: Europeans spent US\$560 million on natural remedies and food supplements in 1986 alone and almost US\$5

billion in 2003 on over-the-counter herbal medicines (Adesina 1998; de Smet 2005). In a number of industrialised countries, about half of the population now regularly use some form of traditional, complementary and alternative medicine (Bodeker *et al.* 2007). The annual world market for herbal medicines in 1985 was estimated to be US\$43 billion and it has been growing steadily since then; it is currently estimated to be over US\$60 billion (Mugabe 1999; WHO 2003). The World Health Organisation estimates that about 80% of the population living in rural areas in developing countries depends on traditional medicine for their health care needs (Bannerman *et al.* 1983). This global estimate has neither been updated nor analysed in detail (Bodeker and Burford 2007). In certain African countries, up to 90% of the population relies exclusively on plants as a source of medicines (Hostettmann *et al.* 2000). About 85% of the population in Swaziland depends on traditional medicine for their primary health care (Mdluli 2002). Traditional Medical Practitioners (TMPs) number in their thousands in the country. The ratio of TMPs to the population in the country is 1:100 while that of doctors and nurses to the population is 1:5953 and 1:356, respectively (Swaziland Ministry of Health and Social Welfare 2006).

Traditional medicine is the first choice of treatment for most Swazis during illness and therefore the mainstay of health care delivery in the country. The popularity of the practice is due to the following socio-cultural reasons: Firstly, the practice is anchored in the cultural and religious beliefs of the people. It is closely intertwined with beliefs of the causes of illness. A person's culture has great influence on the person's perception of life; secondly, traditional medicine has a holistic approach to the healing and prevention of diseases such that the whole person is treated. The body, mind and soul are viewed as indivisible whole connected to the social, physical and spiritual world; thirdly, conventional drugs are very expensive and unaffordable by many in the society, especially in rural communities where most of the populace reside; and fourthly, traditional medicine is accessible and affordable to the rural communities (Makhubu 2002, 2003). TMPs provide an environment that is familiar to the patients and relate to them in a humane manner; they are assured of attention, understanding, sympathy and a solution to their problems, whatever these may be.

Sources of indigenous knowledge used in traditional medicinal practice

TMPs are the main custodians of indigenous knowledge used in traditional medicine in Swaziland. They are much respected by their communities and accorded positions of great importance in the society. They are like Zulu medicine men, who along with the chief, control power in the community (Bryant 1970). They have the patronage of every stratum of society and are consulted not only on health problems but also on almost any other need and perplexity. They are the first port of call in cases of ill health as well as in cases of spiritual, moral, psychological and social problems. They comprise of different categories of people; men, women and youths; almost half are women (Amusan 2006). Each category has different information regarding how indigenous knowledge is used in traditional medical practice but they are often reluctant to divulge information. They acquired their knowledge and skills through communication with ancestral spirits, in dreams and other ecstatic experiences.

Swazis believe in mystical forces; they also believe that ancestors have supernatural powers, which they can use either to benefit the community or to punish offenders (Kasenene 1993). Traditional medical practice rests on these beliefs; ancestral spirits are said to confer the power of healing on selected individuals through visions, trances and dreams (Makhubu 1978, 2003). When a TMP is possessed by ancestral spirits, he or she sees or is given extraordinary things that cannot be seen by ordinary persons, allowing him or her to know plants and other materials used in tradi-

tional medical practice. This indigenous knowledge is transmitted from generation to generation through oral traditions (Makhubu 1978).

TMPs in Swaziland can be grouped into four categories, namely; inyanga, sangoma, umfembi and lucedla (Green and Makhubu 1983; Makhubu 1978). The *inyanga*, *sangoma* and *umfembi* are all diviners and acquire their skills and information through revelations by ancestral spirits in trances, dreams, visions and other religious ecstasies. They are often coerced into the practice by ancestral spirits who may send illness or other trials that can only be resolved by engaging in the traditional medical practice (Green and Makhubu 1983).

The *inyanga* acquires his diagnostic skills by casting bones and thus communicating with ancestral spirits; the *sangoma* diagnoses and determines treatment through communication with a benign supernatural power while in a trance (*kuhabula*); the *umfembi*, acquires diagnostic ability while in a trance in which communication with evil supernatural powers is established – these can be the spirits of people killed in the past by members of his or her family (Kasenene 1993). On the other hand the *lucedla* is a herbalist and does not consult supernatural powers, although he or she is usually very knowledgeable and skilled in the use of plants for treating diseases. Herbalists choose the profession of their own volition.

Although traditionally, it is through communion with the supernatural that skills are acquired, nowadays training of TMPs has been institutionalised. Many old practitioners have groups of trainees or apprentices, who learn by observing the mentor and through initiation into the system. Initiation often involves rituals, which tend to be in the nature of the occult. Apprentices learn how to recognise medicinal plants and learn how to cure a number of ailments in much the same manner as a medical student does in college. In addition, they learn the art of beating drums and different types of songs and dances that mediate trances and possessions by the ancestral spirits. Contact with the older members of the community is therefore essential in acquiring indigenous knowledge on health care. Information so received is then passed on to the next generation, and is usually jealously protected by those who possess it; not willingly divulged to others.

In many instances code names for medicinal plants, inherited from ancestors or those who initiated them into the practice are used as a means of protecting “intellectual property rights”. Code names are not the common names used by ordinary people and accounts for the fact that different names are used for the same plant species (Amusan *et al.* 2004). The meaning of the code names provides a clue to the uses of the plants. These code names, meaning, uses, and how they can be obtained have been recorded. A good example is *Ficus natalensis*, which is generally known in siSwati as *Intfombe*, but is called *umhlabelo wematsambo* by TMPs, denoting the treatment of bone fractures and used by ladies as they are near puberty (Amusan 2006).

Uses of plants in traditional and orthodox medicines

Ethnomedical studies in Swaziland revealed that plant materials constitute the major components of traditional medicine (Amusan *et al.* 2002, 2005a). Animal parts and animal products are also used but to a lesser extent than plants. Information on the use of animals in traditional medicine is usually not divulged because animals are protected in Swaziland. The animal parts used are usually in combination with plant materials. Examples are the use of snail shells with *Abrus precatorius* for treating cataract, the use of the meat of wild animals and *Chilanthus viridis* to drive away evil spirit, and the use of honey from bees for treating colds (Amusan *et al.* 2004, 2005b; Amusan 2006).

Many Swazis are endowed with indigenous knowledge on the use of plants. They can give information on almost any type of plant from their flora for a wide range of ail-

ments in humans and domestic animals, and for magico-medical conditions. Adeniji *et al.* (2000) described 86 types of diseases encountered during the OAU/STRC ethnomedical survey of Swaziland for which 190 herbal remedies were obtained using 100 plant species. The diseases include abdominal colic, anal prolapse, angina pectoris, arterial hypertension, arthritis, asthma, backache, bloody stool, burns, chest pain, chronic penile ulcer, conjunctivitis, constipation, cough, coma, diabetes mellitus, dysmenorrhoea, epilepsy, infertility, fracture, genital warts, haemorrhoids, heartburn, hiccup, hypo-tonic labour, mental illness, nausea, otitis, pneumonia, tonsillitis, venereal disease and weight loss. **Table 1** shows examples of medicinal plants used in traditional medicine in Swaziland which were obtained from a similar ethnomedical survey conducted over a 25 ha of land in Mafutseni area in the Manzini region of Swaziland (Amusan *et al.* 2004). The table shows how diverse the medicinal plants are in terms of species and usage. Thirty five species of medicinal plants used for treating twenty three diseases and five magico-medical conditions were recorded. Different parts of medicinal plants are used as main ingredients in the preparation of traditional medicine. In some cases different parts of the same plant are used for treating different diseases. Some of the plants are used for treating both human beings and domestic animals. In some cases they are used for the same ailment in both humans and animals. Examples are *Ficus natalensis* (*intfombe/umhlabelo*) which is used for treating fracture in both humans and livestock, and *Gunnera perpensa* (*gobho*) for treating uterus problems (Amusan 2006).

Preparation of herbal medicines involves extraction of active ingredients in water in most cases through processes like infusion, concoction and decoction. In most cases secondary metabolites contained in the medicinal plants used in herbal remedies are responsible for the therapeutic actions of the herbal remedies. Apart from the secondary metabolites provided by the medicinal plants, essential nutrients are also supplied through the recipes which account for some of the therapeutic actions (Amusan *et al.* 1996, 2005a). There are also signs that some of the herbal remedies dispensed by TMPs are not just affordable, but are also effective (Stanley 2004). The essential nutrients reinforce the body to fight pathogens. Examples of phytochemicals contained in plants which are of therapeutic importance include organo-sulphur compounds such as allicin, tocotrienols, indoles, carotenoids (e.g. lycopene and β -carotene), and polyphenolic compounds (e.g. quercetin and genestin). Some of these compounds have various properties, including acting as anti-oxidants, which can have a positive influence on health (Poudel and Wildman 2001). It is also believed that the therapeutic action of a herbal remedy may be as a result of the synergistic action of two or more constituents of the plant from which the remedy was made (Schiff and Srinivasan 2001).

Different routes are used in the administration of herbal medicines. Most of them are taken orally. Some are used for enema. Some are burnt and the smoke is inhaled. The powders of some recipes are just sniffed. Many of the recipes are applied to induce vomiting. It is believed that during such vomiting, the substance that causes the sickness is eliminated. The reported therapeutic properties of the medicinal plants used in traditional medicine cannot always be explained in the terms of known properties of the families and species. Many are consumed with porridge or used to induce vomiting (*kuhlanta*), which is seen as an external sign of recovery. The same belief is held by TMPs in Mozambique (Makhubu 1978; Adeniji *et al.* 2004).

About 25% of all prescriptions in the USA contain active compounds obtained from higher plants (Farnsworth 1990). It is estimated that plant-derived prescription drugs there originate from 40 species, 20 of which are from the tropics and generate around US\$40 billion for the American economy (Juma and Ojwang 1996). Many of the drugs administered in orthodox medical practice were discovered through ethnobotanic route using the indigenous knowledge

Table 1 Scientific name, family, siSwati name, voucher number, recipe and use of some Swaziland plants used in herbal medicine.

Scientific name	Family	siSwati name	Voucher № in herbarium	Recipe	Use
<i>Acalypha villicaulis</i> Hochst.	Euphorbiaceae	<i>Umphendulo</i>	L059	Grind together 50 g each of leaves and roots into powder, add to 5 L water and boil.	Wash the body once daily for 3 days to remove bad luck.
<i>Acokanthera oppositifolia</i> (Lam.) Codd	Apocynaceae	<i>Sibhanku</i>	L054	Grind 50 g roots into powder and add to 5 L cold water.	Sprinkle the mixture around the home to prevent snakes from entering the home.
<i>Albizia adiantifolia</i>	Fabaceae	<i>Inhlangushiyane</i>	L056	Grind 50 g roots into powder, add to 2 L water and boil for 2 h.	Take 2 tablespoons of concoction three times daily for 5 days for uterine problems.
<i>Asclepias fruticosa</i> L.	Asclepiadaceae	<i>Pu</i>	L049	Grind 50 g dry leaves into powder.	Inhale the powder until sneezing to bring back ancestors.
<i>Berchemia zeyheri</i> (Sond.) Grubov	Rhamnaceae	<i>Umneyi</i>	L089	Grind 50 g roots into powder, add to 2 L of water and boil for 5 min.	Take a mouthful three times daily for 5 days for anaemia.
<i>Bolusanthus speciosus</i> (Bol.) Harms	Leguminosae	<i>Umhhohlo</i>	L045	Cut 50 g root into small pieces, add to 2 L water and boil for 2 h.	Take 4 tablespoons three times daily for 4 days for ascites. The patient will pass a lot of urine.
<i>Capparis tomentosa</i> Lam.	Capparaceae	<i>Impololwane / Indodebomvu</i>	L065	Grind 5 g dry roots into powder.	Swallow the powder twice daily for 5 days for chest pains
<i>Cheilanthes viridis</i> (Forssk.) Swartz	Adiantaceae	<i>Quphulaka</i>	L047	Grind 50 g leaves, add meat of a wild animal and burn the mixture.	Inhale the smoke twice daily for 3 days to drive away evil spirits.
<i>Cissus quadrangularis</i> L.	Vitaceae	<i>Sihlonhlwane</i>	L050	Grind 50 g stem into powder and add to 2 L warm water.	Bull or cow to drink 1 L mixture a day for two days for liver problems.
<i>Cissus quadrangularis</i> L.	Vitaceae	<i>Umhlahlamphetfu</i>	L081	Grind 50 g stem into powder, add to 1 L water and boil for 3 min.	Take 2 tablespoon three times daily for 5 days for gonorrhoea.
<i>Clausena anisata</i> (Willd.) Hook. f. ex. Benth.	Rutaceae	<i>Umnukelambiba</i>	L080	Grind 50 g roots into powder, add to 1 L water and boil for 2 h.	Take a mouthful three times daily for 3 days for warts.
<i>Coddia rudis</i> (E. Mey. ex Harv.) Verdc.	Rubiaceae	<i>Mahlanganisa</i>	L071	Grind 50 g roots into powder. Burn one half of the powder and mix the residue with the second half.	Add the mixture to incisions in parts of the body far away from the fracture.
<i>Cyphostemma subciliatum</i> (Bak.) Desc. ex Wild & Drumm.	Vitaceae	<i>Likhambiletilonzda</i>	L073	Grind 30 g leaves add to 2 L water and boil for 30 min.	Take a mouthful, three times daily for 10 days for peptic ulcers.
<i>Cyphostemma subciliatum</i> (Bak.) Desc. ex Wild & Drumm and	Vitaceae	<i>Inkhokhabovu</i>	L066	Cut 30 g of each bulb of L066 and L067 into small pieces and add to 1 L hot water, add 50 g of meat and boil.	Take 2 tablespoon of concoction three times daily for 10 days for cancer and abscess. Do not eat meat during the period of medication
<i>Dioscorea sylvatica</i> (Kunth) Eckl.	Dioscoreaceae	<i>Intsani</i>	L067	add to 1 L hot water, add 50 g of meat and boil.	Do not eat meat during the period of medication
<i>Dicoma zeyheri</i> Sond.	Asteraceae	<i>Umtjwatjophinda</i>	L068	Cut 50 g roots into small pieces, add to 1 L water and boil for 1 h.	Take 1 tablespoon three times daily for 3 days for retraction of fontanelle
<i>Dombeya pulchra</i> N. E. Br.	Sterculiaceae	<i>Libuka</i>	L055	Grind 50 g leaves or stem into powder, add to 5 L water and boil.	Open your eyes over the steam while the mixture is boiling three times daily for 4 days for glaucoma.
<i>Euclea natalensis</i> A. DC.	Ebenaceae	<i>Nkunzemnyama</i>	L051	Cut 50 g roots into small pieces, add to 2 L water and boil for 2 h.	Take 3 tablespoon three times daily for 3 days for sexual stimulation.
<i>Euphorbia ingens</i> E. Mey. ex Boiss	Euphorbiaceae	<i>Umhlonhlo</i>	L048	Cut 30 g roots into small pieces and add to 1 L water and boil for 2 h.	Rinse and gargle in the mouth, twice daily for 3 days for toothache and decay.
<i>Gnidia kraussina</i> Meisn.	Thymelaeaceae	<i>Umsilawengwenya</i>	L063	Cut 50 g roots and leaves into small pieces, add into 2 L water and boil for 1 h.	Take 1 tablespoon three times daily for 3 days for dizziness.
<i>Grewia occidentalis</i> L.	Tiliaceae	<i>Liklolo</i>	L090	Grind 50 g roots, add to 2 L water and boil for 5 min.	Take 2 tablespoon three times daily for 7 days for infertility. Both partners should take it.
<i>Helichrysum splendendum</i> (Thunb.) Less.	Asteraceae	<i>Umgobandvodza</i>	L088	Cut 50 g each of leaves and roots into small pieces and burn.	Squat over the smoke to make sure the smoke enters the anus once a day for 4 days for anal prolapse.
<i>Huernia hystrix</i> (Hook. f.) N. E. Br.	Asclepiadaceae	<i>Nomaliliza / Lozililo</i>	L083	Grind 30 g stem into powder and add into 1 L of water and boil for 5 min.	Take a mouthful two times daily for sexual stimulation.
<i>Hyperacanthus amoenus</i> (Sims) Bridson	Rubiaceae	<i>Myalasangweni</i>	L052	Grind 50 g roots and a small piece of the meat of a wild animal into powder.	Dig holes in all the paths leading to the home and add the powder to the holes to prevent wild animals from entering the home.
<i>Hypoxis hemerocallidea</i> Fisch. & C.A. Mey.	Hypoxidaceae	<i>Lilabatseka</i>	L044	Cut 30 g bulb into small pieces, add to 1 L water and boil for 1 h.	Take 2 teaspoons of the concoction three times daily for 3 days for diarrhoea in children.
<i>Lantana camera</i> (Schumach.) W. F. Wight	Verbanaceae	<i>Bukhwebeletane</i>	L057	Add 50 g leaves to 1 L water and boil for 1 h.	Take 3 tablespoon of infusion three times daily for 4 days for malaria.

Table 1 (Cont.)

Scientific name	Family	siSwati name	Voucher № in herbarium	Recipe	Use
<i>Lippia javanica</i> (Burm. f.) Spreng.	Verbenaceae	<i>Umsutane</i>	L069	Grind together 50 g leaves each of L069 and L070 into powder and add to 5 L water.	Wash your face and hand once to remove bad luck when exposed to a corpse.
<i>Combretum molle</i> R. Br. Ex G. Don	Combretaceae	<i>Imbondvo</i>	L070		
<i>Melia azedarach</i> L.	Meliaceae	<i>Umsilinga</i>	L064	Grind 50 g roots into powder, add to 2 L of water and boil for 1 h.	Take 2 tablespoon three times daily for 5 days for anal prolapse.
<i>Peltophorum africanum</i> Sond.	Fabaceae	<i>Sikhabamkhombe</i>	L084	Grind 50 g bark into powder and add to 5 L water.	Drink to induce vomiting once a day for 3 days for bad luck and heartburn.
<i>Psidium guajava</i> L.	Myrtaceae	<i>Umgwava</i>	L074	Add 50 g leaves to 2 L water and boil for 5 min.	Take orally 2 mouthfuls three times daily for 5 days for menorrhagia.
<i>Sansevieria hyacinthoides</i> (L.) Druce	Dracaenaceae	<i>Sitfokotfoko</i>	L062	Grind 50 g roots into powder and add to 5 L water.	Sprinkle the mixture around the homestead once whenever you need to bring back ancestors.
<i>Sansevieria hyacinthoides</i> (L.) Druce	Dracaenaceae	<i>Umwashanhloa</i>	L078	Grind 30 g roots add to 1 L water and boil for 1 h.	Pregnant woman to take concoction as tea regularly for safe delivery. Squeeze the juice from the leaves into the ears for otitis media.
<i>Sarcostemma viminale</i> (L.) R. Br. and	Asclepiadaceae	<i>Ingotjwa</i>	L042	Cut 50 g each of the stem of L042 and leaves of L043 into small pieces, add to 1 L water and boil for 1 h.	Take three tablespoons of the concoction three times daily for 10 days for venereal diseases and gonorrhoea.
<i>Cardiospermum halicacabum</i> L.	Sapindaceae	<i>Likhambilemamba</i>	L043		
<i>Sclerocarya birrea</i> (A. Rich.) Hochst.	Anacardiaceae	<i>Umganu</i>	L061	Cut 30 g bark into small pieces, add to 2 L water and boil for 10 min.	Drink enough mixture to induce vomiting and wash the body once daily for 4 days to remove bad luck.
<i>Spirostachys africana</i> Sond.	Euphorbiaceae	<i>Umfombotsi</i>	L076	Burn 50 g roots, add the residue to 2 L water and boil for 1 h.	Take 1 tablespoon twice daily for 10 days for infertility.
<i>Tetradenia riparia</i> (Hochst.) Codd	Lamiaceae	<i>Liphunganhloa</i>	L075	Grind together 50 g each of leaves, roots and stem into powder, and add to 5 L boiling water.	Sprinkle the concoction on the bull or cow for good health. Wash a person with bad luck with the concoction.
<i>Vernonia crataegifolia</i> Hutch.	Asteraceae	<i>Luhlunguhlungu</i>	L053	Grind 30 g roots into powder and add to a cup of warm water.	Give 1 tablespoon once a day for 2 days to a child to stop diarrhoea.

Source: Amusan *et al.* (2004)

of the TMPs. This involved the screenings of efficacious herbal remedies and such screenings have provided good leads in the discoveries of novel therapeutic compounds. The potential for further discovery of drugs from plants is enormous because most of the indigenous plants have not been explored. However, human beings are being used inadvertently as guinea pigs because the TMPs who are sources of the information used in drug development have no trials in any other animal model apart from humans. The sanctity of human life is thereby compromised. This is the major disadvantage of traditional medical practice. The fact that a preparation has been used for ages in traditional medical practice is no guarantee that it is safe. It may have some underlying deleterious effects which may be missed by a non-scientific world. An example in drug development is the thalidomide catastrophe in which the teratogenic property of thalidomide was missed until the drug was introduced to therapy. The drug was introduced in late 1950's and withdrawn at the end of 1961 because it was responsible for an outbreak of phocomelia. But within the short period of introducing the drug, it caused deformity in about 10,000 children (Goldstein *et al.* 1974). Since no one monitors the use of traditional medicine and the effect in the population, no one can say with certainty that such deleterious effect of drugs is not happening in traditional medical practice.

Ethical issues in traditional medical practice

Ethics is defined as the science of moral value. It is the moral principle that governs how an individual should operate in a profession. In most professions, ethics play a major role in setting the limits of how far members can go in terms of what is done or left undone. There is usually a code of

ethics to which members of a professional body are bound. This is to ensure they act in accordance with the norms of professional practice. Any violation of the code of ethics usually attracts penalties for erring members. It is through the professional ethics that the integrity of the profession is protected from disrepute. When one exceeds the limit set by professional ethics, one has flouted the law and depending on the gravity of the offence, one can be prevented from practicing that particular art however competent or skilful one may be in that profession. Ethics is therefore an integral part of any professional training. It is particularly important in professions that are directly dealing with human life like the medical profession. It controls the moral behaviour of the practitioners and how they practice their art and relate with their patients and the public at large.

Therefore, TMPs in each country should have a code of ethics for their practice like the orthodox medical practitioners and other professional bodies. In many African countries such a code of ethics does not exist for the TMPs. This is particularly true in countries where traditional medical practice is not legally recognised by governments. Misconduct and malpractices of TMPs in such countries are difficult to define since no law binds them. This is in spite of the efforts and strategies of the WHO African Region to ensure the development and integration of traditional medicine in the health delivery systems of countries in Africa.

In Swaziland, for example, in spite of the fact that traditional medical practice is so pervasive, and an accepted part of life, it is not recognised in the country. There is no policy or legal instrument for traditional medical practice neither is there any regulatory body for the control of the practice. The Traditional Medical Practitioners in the country comprise of three groups: the first group consists of those who are affiliated with the Traditional Healers Orga-

nisation, the second group consists of practitioners who are affiliated with *Tinyanga Tendzabuko* and the third group consists of practitioners who do not belong to any organisation. None of the two groups is registered with the Ministry of Health and Social Welfare or any other arm of the Government of Swaziland. They frown at the idea of integrating traditional medical practice with conventional medical practice in the country (Maseko 2007). This is presumably out of the fear that such integration would involve regulation of their practice.

Like in most developing countries where traditional medicine is practised, none of the remedies dispensed in traditional medical practice in Swaziland has been scientifically validated for purity, safety and efficacy (Amusan *et al.* 2005b). Patients who patronise the practice take the medicines just on trust relying on the claims by the TMPs for the medicines. The placebo effect must not be underestimated even with the traditional medicines. The fact that a person feels better does not mean the person is getting better.

In many instances patients only consult orthodox medical practitioners after traditional medicine has failed them and their cases have become too complicated for any remedy. Patients spending time with TMPs may waste precious time which may lead to complications that would otherwise have been treated, had the patient gone to hospital earlier, for example, a cancerous lump which if removed early will save a life, may become too late and fatal if not attended to on time (Gina 2007).

Many of the plants used in traditional medicine are poisonous and there is no precise dosage for most of the remedies prepared from them. This compounds the problem of safety. An example of a plant which is very deadly if not used properly is *Trichilia emetica* (*umkhuhlu* in siSwati). It is used for treating waist problems, for boosting libido and for backache (Amusan *et al.* 2002; Amusan 2006).

Another major safety issue connected with the use of traditional medicine is the lack of information on how traditional herbal remedies may be interacting with conventional or other medicines a patient may be taking concomitantly with traditional herbal medicine. Information is lacking since no one has investigated such an interaction. Such information is readily available with conventional drugs because the drugs were adequately studied and approved by appropriate authorities before they were introduced to the market.

Some of the claims by the TMPs are questionable in that in many instances a single traditional remedy is claimed to cure many unrelated diseases. An example that is very common in traditional medical practice in Swaziland is the treatment of conditions generally known in siSwati as “*inyongo*”. Each TMP usually has a remedy for “*inyongo*” yet the conditions termed “*inyongo*” are not for a single disease but for some unrelated diseases like gallstones, gastroenteritis or hepatitis (Gina 2007). The unsuspecting patients who are in need and who have no access to orthodox medicine are thereby exploited. The practice of traditional medicine is usually surrounded with a lot of secrecy, rituals and metaphysical power which may be tending to the occult. The secrecy surrounding traditional medical practice is even extended to the members of the profession. Each practitioner protects the skill and information he/she has and does not disclose these even to fellow practitioners. As a result, referral cases among TMPs are rare. Because of secrecy in traditional medicine, a lot of information is not recorded and as the TMPs die, they pass away with their knowledge on health which should have been documented for future generations. Complications and deaths arising from improper management of diseases in traditional medical practice are generally not recorded. No one is accountable for such deaths. These scenarios expose the public to a lot of dangers from toxic materials, unknown drug interactions, and to exploitation and abuse by unscrupulous traditional medical practitioners.

Ritual killings and the use of human parts for preparation of “*muti*” or witchcraft are serious issues that most

people deliberately avoid in discussing traditional medical practice. It is a major disadvantage for promoting traditional medicine as although no TMP would claim in the open to be involved in such activities but it is common knowledge that ritual killings do occur in many African societies. It is especially most common during periods of parliamentary elections in Swaziland. It is such an open secret that His Majesty King Mswati III recently had to give warning to the Swazi nation about ritual murders to gain the confidence of the electorate in the forthcoming general elections. He gave the warning at this year’s annual *bugamu* festival (Masango 2008). The involvement of ritual killings and witchcraft in traditional medicine must have been one of the reasons why the colonial powers made efforts to outlaw the practice in Swaziland in 1894 through the Witchcraft Act (Green and Makhubu 1983) and why the practice is still unrecognised today in Swaziland and many other countries. Traditional medicine as defined above should be for human benefit and not for destruction of lives. It is when cultic elements and rituals are involved in traditional medicine that it leads to harm and destruction of lives.

Government in each developing country can address these ethical issues detrimental to the practice of traditional medicine through a clear policy on traditional medicine. Such a policy should emphasise the use of medicinal plants of proven efficacy and safety, and outlaw practices involving rituals and witchcraft. TMPs, their patients, and all other stakeholders involved in traditional medicine should be educated on the ethics of the practice of traditional medicine to bring the practice could be in line with the conventional medical practice.

Conservation of biological diversity

Swaziland is endowed with a very rich and diversified flora and fauna in terms of species present. She is one of the African countries where the overall plant diversity is known to be at the highest level (Fuggle and Rabie 1992). It was in recognition of the diversity of biota in the country and the prevalence of traditional health practices that the Inter African Committee of Experts on African Medicinal Plants and Traditional Medicine decided in 1996 to conduct an ethnobotanical survey of the country, as part of a broader study covering the African continent.

A recent estimate indicates that 25% of the total number of higher plants in the world is found in the southern Sahara of Africa (Klopper *et al.* 2006). The flora of Swaziland contains 3,441 species included in 1,124 genera and 244 families (Braun *et al.* 2004). One would appreciate the great diversity in flora when one realises that the size of the country is just about 17,000 square kilometres in area and the number of terrestrial higher plants throughout the world is about 250,000 to 500,000 (Chadwick 1994; Tempesta and King 1994). Some of the species are endemic and they play significant role in the development of the country. However, most of the species are being threatened by population growth, over-exploitation and drought. For example, *Hypoxis hemerocallidea*, a popular medicinal plant in the country and Southern Africa has become an endangered species because it has been over-harvested for various uses in traditional medicine especially for HIV/AIDS and related illnesses (Amusan 2006).

The unsustainable harvesting of the bark, root and whole plants for medicinal purposes by TMPs without cultivating them has led to the extinction of some species while others are endangered. The extinction of these medicinal plants does not mean a loss of the plants only but also a lost in both knowledge and the skills of recognition and identification of climatically adapted indigenous plants that have previously sustained the society (Amusan *et al.* 2005b). Many TMPs prefer medicinal plants from the wild to cultivated ones. They claim that medicinal plants from the wild are more potent than cultivated ones. Their claim may have some scientific basis because studies have shown that secondary metabolites are produced in larger quantities under

conditions of environmental stress. This may be due to dilution factor whereby concentration of secondary metabolites in plants is compromised for large vegetative growths which usually occur during propagation with nutrient supplement to the soil from fertilisers and exotic manures (Edje *et al.* 1999). This is an area where research can enhance the development of traditional medicine. The composition and concentrations of constituents of herbal remedies can be provided through analysis by researchers which would guide in formulating dosages for herbal remedies. This would involve collaboration between researchers and TMPs.

The collection of medicinal plants from the wild in an unsustainable manner impacts negatively on nature conservation and should be discouraged. Cultivation of medicinal plants is a conservation measure which should be encouraged by all users of medicinal plants. Studies on production practices to establish profiles for propagating medicinal plants should be encouraged. TMPs and researchers who deal with medicinal plants should have medicinal gardens where they propagate plants for their use. Such medicinal gardens would not only serve as means of conserving biological diversity, they would be sites for establishing production practices for the medicinal plants.

The documentation and preservation of the indigenous knowledge of the TMPs on medicinal plants not only help in the preservation of their intellectual property rights but also enhance the conservation of the biological diversity (Miah and Chowdhury 2003). The issue of conservation of the biodiversity is best tackled in a multi-sectoral manner involving researchers, health, water and forest authorities, ministries of agriculture and environment (Adeniji *et al.* 2004). This generation has a moral responsibility to protect and preserve the environment for future generations.

Intellectual property of traditional medical practitioners

Intellectual property refers to the intellect of human mind: the innovation, creativity, knowledge or ideas of individuals which can be exploited for commercial purposes and therefore need to be protected as private rights. It is essential for one to acquire exclusive rights over the commercial exploitation of one's innovation. In many instances TMPs use code names for medicinal plants. They claim that they inherited the code names from their ancestors or those who initiated them into the practice (Amusan 2006). The code names are used as a means of protecting "intellectual property rights" of the practitioners. Code names are not the common names used by ordinary people and account for the fact that different names are used for the same plant species. An example is *Cissus quadrangularis* L. known as *Sihlonhlwane* by one TMP and *Umhlamphetfu* by another TMP (Amusan *et al.* 2004). The meaning of the code names provides a clue to the uses of the plants. These code names, meaning, uses, and how they can be obtained have been recorded. Another good example is *Ficus natalensis*, which is generally known in siSwati as *Intfombe*, but is called *umhlabelo wematsambo* by TMPs, denoting the treatment of bone fractures and used by ladies as they are near puberty (Amusan 2006).

Traditional Medical Practitioners who possess the indigenous knowledge on medicinal plants often claim that they have been "exploited" by scientists and "foreigners" or people outside their community. Therefore, they are often reluctant to share information on medicinal plants with others. Even within the family group, only a selected few are granted the privilege of having access to the body of traditional knowledge. These individuals are carefully selected and are known to be the ones who will inherit the knowledge and take over the practice at the demise of the older generation.

It has been observed that international drug companies often use the indigenous knowledge embodied in traditional medical practices to develop new drugs; unfortunately, much of the benefit accrues to them and not to the indigenous people who own the indigenous knowledge (Mugabe

1999). The claim by indigenous people of being exploited therefore has some credibility.

TMPs, individuals and indigenous communities in developing countries who provided the basic information on medicinal plants that have been exploited for economic benefit should be accorded the intellectual property rights for the development. In biological prospecting for drug through traditional medicine recognition should be accorded the TMPs through equitable sharing of economic benefits accruing from any commercial exploitation of their knowledge and creativity. Concrete agreement should be made between researchers or companies with custodians of indigenous knowledge right at the onset of any project with clear terms to all the parties. Indigenous knowledge is usually community based: it is a collective property of a community. Therefore benefit should be shared with the communities rather than with a few individuals. Governments of developing countries endowed with genetic resources being exploited should be involved in securing intellectual property rights for their people.

Some of the strategies available to secure these rights could revolve around the development of intellectual property systems, as well as a *sui-generis* system of intellectual property protection; other approaches could involve entering into bilateral contractual arrangements of creating a new system combining various elements of each of these (Miah and Chowdhury 2003). This would allow for the rightful ownership to be established and subsequently, could provide important economic benefits.

CONCLUSION

Although traditional medical practice is pervasive in Swaziland and many developing countries, and it plays a great role in the health of the nation and in drug development, it has not been incorporated in to the formal health delivery system of Swaziland and many developing countries. This hinders the development of traditional medicine. In advocating for the development of the practice, however, ethical and environmental issues connected with the practice should be addressed through legislation and research.

Information about the practice should be systematically gathered, analysed and evaluated throughout each developing country to recognise the valuable contribution of the practice to each nation. TMPs should be more open in sharing their knowledge with researchers so that information on plant genetic resources which are useful in health care may be properly documented and investigated to establish the basis of their therapeutic actions. Formal recognition should be given to the practice through a national policy. The national policy on the practice should spell out the framework for its operation within the overall health delivery system of the country. The legal instrument should regulate the practice to ensure safety of the populace. Emphasis should be on aspects of traditional medicine that are beneficial to humans and which promote health. This would lead to the development of the practice and a better service to those patronising the practice.

There should be more collaboration between TMPs and researchers. Such collaboration should be with mutual trust and respect. Information that is usually required about efficacy and safety of herbal remedies before regulatory bodies could approve them for prescription to the public can only be obtained through research. Collaboration of TMPs with researchers would therefore, be beneficial to the TMPs. It would lead to the development and improvement of herbal remedies of proven purity, efficacy and safety. Such herbal remedies would be useful in an integrated primary health delivery system of any developing nation. This would be in line with the 31st World Assembly adopted resolution, WHA31.33 of 1978 which called for the compilation and classification of medicinal plants with their therapeutic properties in relation to other drugs so that they could be used in an integrated health delivery system of each nation (WHO 1996). An integrated medical system in-

volving both orthodox and traditional medicines would also provide a larger workforce in the medical field for the nation. Such a system is already in operation in China. It is also feasible in African countries as demonstrated in *Clinique de Manongarivo* in Madagascar (Quansah 1999).

Conservation measures should be taken to protect medicinal plants from extinction. This should be done with the involvement of all stakeholders right from the grassroot level. Propagation of medicinal plants and harvesting them in a sustainable manner are essential elements of conservation of the flora. Governments, Local authorities, Non Governmental Organisations and other stakeholders should promote public awareness on the need to protect medicinal plants and biological resources in general. Laws should be enacted and enforced for the protection of medicinal plants. The environment should in no way be abused through unsustainable exploitation. Humans should be good stewards of the resources in the environment. It is the responsibility of this generation to protect and improve the environment for future generations (United Nations 1977). The constraints associated with the conservation of biodiversity and ethical issues in the practice of traditional medical practice and bioprospecting for drugs through ethnobotany are not restricted to Swaziland but are applicable to many other developing countries of the South which are endowed with abundance of genetic resources that could be exploited in orthodox medicine.

Researchers and pharmaceutical companies should acknowledge and adequately reward the custodians of indigenous knowledge they exploit for commercial purposes. Benefits should be ploughed into the community for its development in such a way that future generations can share in such benefits. Pharmaceutical companies exploiting the indigenous knowledge from a community could think of establishing research institutions or factories in such a community for the direct benefit of the community.

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