Journal of Medicinal Plants Research Vol. 4(15), pp. 1508-1516, 4 August, 2010
Available online at http://www.academicjournals.org/JMPR
DOI: 10.5897/JMPR10.282
ISSN 1996-0875 ©2010 Academic Journals

Review

Current phytotherapy – an inter-regional perspective on policy, research and development of herbal medicine

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Accepted 22 June, 2010

This article aimed at evaluating inter-regional differences in herbal drug policies, with a view to influencing such policies towards a more vibrant approach that will promote the registration, production and clinical trial of herbal remedies worldwide. The review drew attention to the impact of different national policies on the status and movement of herbal remedies in the world market and revealed a striking paradox - that about 80% of people in developing countries depended on herbs, but contributed only 7.2% to the trade in 1999. By contrast, the developed nations, where people relied less on herbs, contributed 55.2%. Asia, less Japan and South Korea, contributed 37.6%. Equally interesting is the comparison of Brazil with Nigeria. Both are rich in biodiversity and have high populations that depend substantially on herbs. However, while herbs contributed an unknown amount to the Nigerian economy in 2007, in Brazil it contributed US$ 160 million - a whopping 20% of Nigeria's federal budget for health ($800 million) in 2007. These findings led us to conclude that developing countries need strategies that will promote herbal medicine. The comparison of Brazil with Nigeria revealed that with proper strategies herbal drugs can indeed contribute substantially to any economy.

Key words: Nigeria, phytotherapy, inter-regional differences, research, policy, development, developing countries, developed countries, herbal medicine.

INTRODUCTION

This article is a sequel to "Current phytotherapy - a perspective on the science and regulation of herbal medicine" (Ameh et al., 2010), but was prompted by a World Bank supported ethnobotanical survey of Nigeria by researchers at the National Institute for Pharmaceutical Research and Development (NIPRD) in 2009, which revealed a score of promising herbal remedies for diabetes mellitus. Preliminary studies are ongoing to reveal the most promising. Thus, one reason for this review is to create in advance an attitude favorable to clinical research of the most promising.

A favorable scenario might consist of the following: a licensed herbalist who has for 20 years or more, used a particular recipe and has patients under observation on it, a clinical outfit with facilities for monitoring diabetes mellitus, a favorable safety and toxicity report on the recipe and a study protocol approved by the Institute and the National Agency for Food and Drug Administration and Control (NAFDAC).

The most pressing issues for which answers must be provided would be: (i) Does the recipe of interest conform to the WHO limits for heavy metals, aflatoxins, microbial load and specific microorganisms? (ii) Are there dependable criteria for identifying the herb or herbal substance, such as TLC or high performance liquid chromatography (HPLC) fingerprints? (iii) Are there dependable criteria of consistency, such as loss on drying, ash values and water extractability for the herb or herbal substance? (iv) Are there threats from toxic phytochemicals like cardiac and cyanogenic glycosides? (v) Is the recipe safe (and efficacious) in laboratory animals? Once there are satisfactory answers to these questions and there is substantial compliance with the

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Table 1. Documentation of the safety of use of an herbal drug based on traditional experience.

State of affairs / knowledge of safety	Type of action that needs to be taken
No toxicological data exist	Documented experience of long-term use of at least 20 - 30 years without any problem should form the basis of risk assessment.
Some toxicological data exist	(a) The period during which the drug had been in use should be noted. (b) The health disorder treated with the drug should be noted. (c) The number of patients so treated should be noted. (d) The location in which the treatment was carried out should be noted.
There is toxicity	(a) Attempts must be made to establish its dose-dependency. (b) Attempt must be made to explain (a) above.
There is potential for misuse	All cases of abuse or dependence must be documented.
Long-term use cannot be proved	Attempts must be made to conduct toxicity studies

The above was prepared based on guidelines provided by the World Health Organization (WHO) regarding the documentation of the safety of use of an herbal drug based on traditional experience, as highlighted in our review on the science and regulation of herbal medicine (Ameh et al., 2010).

guidelines shown in Table 1, then there is a good ground for clinical trial. The rest of this review will dwell on how proper strategies have promoted herbal medicine in the developed economies and others like India and China, and how the same approach can be applied in a developing country like Nigeria to promote safe herbal remedies.

The aim of this article

It is generally agreed that the declaration in Alma-ata of 1978 was the turning point in public perception of traditional medicine (TM). The declaration ushered in a positive attitude, galvanized research and paved the way for the current popularity of TM and phytotherapy in particular (Ameh et al., 2010). We note that whereas herbal remedies are called dietary supplements in the US, thereby shifting emphasis away from their medicinal attributes, the dietary supplement act of 1994, which occasioned the shift, actually helped to promote herbal medicine in the US, albeit indirectly, through the innovative provision it made for user information. In the US, user information insert is designed to reflect the understanding that herbal formulas have not been evaluated by the US-FDA; are sold as dietary supplements and are not intended to diagnose, treat, cure or prevent any disease and that the content of the insert is for informational purposes only and is not intended as a substitute for professional advice (Chineseherbsdirect.com, 2010). The net effect of this approach has been a shift in attitude in favor of increased patronage of the products (Goldman, 2001). A similar situation held Europe, where the net effect of the laws and rules passed on herbal remedies has been to promote their production and use (Smet, 2005). We draw attention to the fact that although, Asia contributed US$ 7.3 billion to herbal world trade in 1999 (Mapdb.com. 2003), by 2005, China's contribution alone rose to US$ 14 billion (WHO, 2008). This was due to policies and programmes that favored herbal medicine – the cornerstone of Traditional Chinese Medicine (TCM). Similar situations held sway in the Indian sub-continent, where government policies also favored herbal medicine. However, in many developing countries like Nigeria, a totally different picture obtained, not because policies were against herbal medicine, but in these countries there had been a lingering absence of proper policies and laws supportive of traditional remedies. Indeed, it is a paradox, or rather, an anomaly, that TM should be least supported where it is most needed. In this review we describe the structure of this anomaly and its global dimensions; and propose how it may be addressed by developing countries like Nigeria.

AN INTER-REGIONAL VIEW OF HERBAL REMEDIES BEFORE 1978 – AS ILLUSTRATED WITH THE UK AND NIGERIA

For many years before 1978, herbal remedies were mostly sold in the UK as unlicensed medicines by virtue of an Act of Parliament (UK Medicines Act, 1968). That Act scarcely provided for safety, quality, or user information. Herbal remedies then had little or no posological support. Both before, and after the setting up of Nigeria's NAFDAC in 1993, herbal drug regulation had been, and remains essentially, as that of the UK in the 1960's. Although, there are no laws prohibiting herbal medicines in Nigeria, there are no well articulated laws promoting them either, as in Brazil, Europe, North America, China and India. Nigeria's current herbal drug

Table 2. Aims and priorities of medicinal plant research (MPR) - a comparison between the developing and developed economies.

Aim and priorities of MPR	Developing economy	Developed economy
To ascertain that materials under study are safe and efficacious.	About 80% of the people depend on herbal medicines (HMs), hence the need for MPR to optimize benefits and resources.	Demand for HMs is rising. Example: In the US the number using HMs rose from 2.5% in 1990 to 37% in 2000. MPR and trials are needed to spot racial differences since most HMs originate outside the region.
To isolate and identify active principles in the materials.	This aim is not yet a top priority, but will stimulate research, and bulk production of materials.	This is a key aim that stimulates the drive towards industrial production of fine chemicals.
To develop specifications for materials/ GMP guidelines.	Since this aim partly relies on indigenous knowledge, it will add value to local industry, and increase the benefits of biodiversity and long experience.	Increased knowledge of the plant material would lead to more efficient systems of cultivation, or other means of production, e.g., tissue culture.
To prepare the ground for full scale techno-economic exploitation of findings.	Full scale exploitation may mean improved cultivation, or some other forms of efficient production.	Full scale exploitation may mean the discovery of a synthetic process for producing the HM or its analogue.
Conclusion	On the whole HMs are considered more in their current form of usage, but the situation is gradually changing.	On the whole HMs are considered more for their potential to generate other medicines.

The above was prepared based on our perception of a lively debate that ensued at the symposium on "Research Continuum in Natural Products Drug Discovery", held at Transcorp-Hilton, Abuja, Nigeria, May 12 - 14, 2009, cosponsored by the NIH and NIPRD. The event, chaired by the Minister of Health attracted scholars from the US, Europe and countries in Africa, including Ghana and South Africa; and was attended by ambassadors, including that of US to Nigeria. The subject of the said debate was the question of what should be the top aim and priority of medicinal plant research in developing countries, like Nigeria. A similar issue had come up the previous year during an international conference on "Green Chemistry and Drug Development" held in the same venue and chaired by the Health Minister.

status is such that, should an investor in herbs desire to regularize his or her operations, hurdles would appear from nowhere to frustrate them, not out of mischief, but more out of fear created by the uncertainties that result from the absence of enabling laws. This state of affairs is antithetical to the development of the industry. If indeed, there are laws regulating the industry in Nigeria, they are obsolete and grossly inadequate - they need to be updated to meet the challenges of the time. In contrast to the foregoing, the UK, and indeed, the entire the EU, is currently working towards a scenario in which by April 2011, all manufactured herbal remedies will be required to have a Traditional Herbal Registration or a Marketing Authorization to qualify for use (Ann Godsell Regulatory, 2008). Although, most developing economies like Nigeria have the comparative advantage of biodiversity and a long herbal tradition, there had been a continuing absence of the proper mix of laws, policies and attitude. But, whenever there had been an occasional good move in policy, there had been a proportionate change for the better. An example is the development in the 1990s of Niprisan (the sickle cell drug) by NIPRD, founded in 1989. This particular development pointed to the comparative advantage that developing countries like Nigeria have; and to the challenges they face in their effort to modernize their TM remedies. But before looking at these challenges and the proposals for redressing them, it is needful to periscope the situation in other regions of the globe. It is particularly needful to first gain some insight into how developing countries compare and differ from the developed in terms of their aims and priorities in herb research. The comparison is presented in Table 2. It suggests that inter-regional differences in aims do affect the general direction of herb policy, research and development in the different regions.

HERBAL MEDICINE IN THE OECD COUNTRIES – WITH SELECT REFERENCES

As was well demonstrated by events during the Clinton Administration and earlier on in the current Obama Administration, health remains a hot issue in all the developed economies, grouped as the Organization for Economic Cooperation and Development (OECD). The 30-member body was founded in 1961 to coordinate economic policies of industrialized nations. In 2009, it comprised 22 countries in Europe; 4 countries in North America - Canada, Iceland, Mexico and the US; 2 countries in Asia – Japan and South Korea; and 2 countries in Oceania – Australia and New Zealand. Health is a hot issue in these nations because of the heavy investment in health insurance, medical facilities, drugs and research. For example: in 2009, the US and

Table 3. The categories of data required for the registration of herbal remedies in the EU.

Type of data	Details of data
Product information: Summary of product characteristics	These are: 1. Name of the product. 2. Strength. 3. Dosage form. 4. Quantity of active ingredient. 5. List of excipients. 6. Shelf life. 7. Posology/ method of administration. 8. Indications. 9. Contraindications/ special warnings. 10. Precautions for use. These are used as the basis for any insert, package information, or advertisement. Insert must undergo a process called "readability" (or "user") testing, to ensure clarity.
Quality control data: Refer to GMP requirements for production.	The requirements apply to raw material and finished product, and include: 1. Production must be in a GMP compliant facility. 2. The medicine must be produced with a validated formula. 3. There must be a finished product specification. 4. The product must be manufactured at least on pilot scale and three batches used for stability studies. 5. Stability studies should be carried out on the product packaged in the container proposed for marketing. 6. A summary of the stability studies undertaken must be provided. 7. From the stability data shelf life and storage precautions should be proposed. 8. A quality dossier must be provided for both starting materials and finished product. 9. The product must be produced from herbs that have been cultivated and harvested in accordance with Good Agricultural and Collection Practice (GACP). 10. The raw material must be evaluated for risk of any environmental contamination.
Safety data requirements: Refers to safety pharmacology, including animal and human studies.	The data may be assembled from: 1. Published animal or human studies. 2. Review of any potential interactions with other drugs, side effects, and any proposed contraindications/ precautions. 3. Recognized monographs on the material or product with information on safety. 4. Any information concerning special groups such as children, the elderly or pregnant women.
Traditional use evidence: Refers to history and prevalence.	There is no requirement to prove efficacy (De Smet, 2005). Instead data must provide reference that the product has been in use as medicine for 30 years or more, of which the last 15 must be in Europe. The data must be presented specially - in a Common Technical Document Format.

The above was drawn based on data gathered from references including (DSHEA, 1994; Goldman, 2001; De Smet, 2005; Ann Godsell Regulatory, 2008).

Japan respectively spent $2.283 trillion and $410.7 billion on health; and in 2010, the US budgeted $30.8 billion for the National Institute of Health (NIH), whereas the entire budget of the Federal Republic of Nigeria was $26.7 billion. In 2007, the US spent $34 billion on complementary and alternative medicines (CAM) in which herbal remedies feature most prominently. Indeed, phytotherapy is well entrenched in all the OECD countries. In some, but not all, herbal remedies are fully integrated into their national health care system and are paid for by health insurance. In both Korea and Japan, TCM (called Kampo medicine in Japan) has been in vogue for centuries and proven remedies are covered by health insurance (Kenner, 2010). In the US, the popularity of phytotherapy began to rise in earnest around 1994. A survey conducted there in 2004 showed that it was the most commonly used CAM therapy, at about 18.9% (Barnes, 2002). Herbal remedies are also very popular in Europe (De Smet, 2005), especially in Germany, France, Spain, and the UK - where several Universities offer degrees in Herbal Medicine. A review had shown that herbal therapies were supported by strong evidence, but not widely patronized (Cochrane Collaboration, 2004). However, in both the US and EU, 1994 and 2004 were important years for herbal remedies. The DSHEA took effect in the US in 1994; the European directive on Traditional Herbal Medicinal Products (THMP) took effect in 2004 and massive US funding for clinical trials of herbal remedies began in 2004 (Cochrane Collaboration, 2004). Indeed, in the EU, with effect from April, 2011, all herbal products making medicinal claims must be registered in accordance with the THMP, which became operational in 2004. The types of data required for such remedies to be so registered are described in Table 3.

HERBAL MEDICINE IN SOME STATES OR REGIONS OUTSIDE THE OECD AND AFRICA

The Middle East has a rich tradition of CAM, in which herbal remedies are preeminent. Some 200 - 250 herbs are well traded and used both within and outside the region. However, herbal remedies in the region are mostly prescribed and used outside the governmental health care system. In some cases, herbs currently in use may not even correspond to the plants described originally in the literature (Azaizeh et al., 2006). In many other Asian States, especially China, India, Indonesia, Nepal and Sri Lanka, there are extensive TM services,

including herbal remedies, within the national health care systems. Although, traditional herbal medicine thrives in the Pacific region, the practice is not as well entrenched as in Southeast Asia. For example, in 2005, the Government of the Philippines endorsed 10 medicinal plants for use in her "Traditional Health Program", but did not go far enough to regularize and entrench their use through GMP production (Philippines herbal medicine.org. 2005).

It seems that no country in Latin America or in the world, for that matter, epitomizes the paradoxes of the global trade in herbs as much as Brazil. The reasons for this are as diverse as they are many, and may even seem contradictory; but, to understand the Brazilian situation in the foregoing context is to understand where the world is, and where it could be, with proper changes in herbal policy and direction worldwide. Indeed, several influential institutions (the White House, the Japanese and European monarchies, especially the Prince of Wales) have variously expressed sentiments reflecting the enigmas of the world's herbal industry and favoring CAM and this kind of policy change (Cohen, 1998; Singh and Ernst, 2008; Walker, 2009). In any case, Brazil indeed, presents an enigma because, as one of the largest and most populous countries in the world and one of the most industrialized in Latin America, she is not an OECD country. Secondly, Brazil has the greatest plant diversity in the world, with close to 55,000 species out of an estimated total of 450,000, yet herbal remedies contributed only $160 million to the Brazilian economy in 2007 (WHO, 2008; Frayssinet, 2010).

Thirdly, despite Brazil's rich and deeply rooted herbal tradition, derived from three sources - Amerindian, European and Yoruba – (Grotte, 2008; Ameh et al., 2010), phytotherapy in Brazil is not as vibrant as Ayurveda is in India or as TCM or Kampo medicine is in South Korea or Japan. Fourthly, Brazil stands out as one of the first to commence the actualization of the Alma-Ata Declaration of 1978, leading to the Brazilian National Programme of Medicinal Plants and Phytotherapeutics (NPMPP) – a most promising and forward looking program in the 1980's. But, although, the NPMPP had lofty goals, and early earmarked 71 plants for detailed study, Brazil's public health system officially only offers herbal remedies from three plants: *Maytenus ilicifolia*, for gastritis, ulcers and other illnesses; and *Mikania guaco*, a soothing expectorant for cough. This is a far cry from its immense biodiversity and market for herbal remedies. There is however, the FIOCRUZ experimental station in Brazil, where 126 natives tend exotic species cultivated in a large expanse of land - like an "open-air pharmacy" (Frayssinet, 2010). The plants include: *Vernonia ruficoma* - used to treat flu, bronchitis and cough; *Buccharis trimera* - used for stomach ulcers and wounds; and *Aloe vera* – an antiseptic, used for wound healing and can also be used to combat dandruff and hair loss (Frayssinet, 2010). Much as Brazil has performed less than she had intended at the dawn of the Alma-ata declaration, she has nevertheless done far more than all of Africa combined, including Nigeria – a signatory to the declaration. But before we turn to the situation in Africa, it seems appropriate to first take a glance at the situation in India and China, where herbs and TM have been acclaimed a great success.

INDIA AND CHINA – TWO KEY SUCCESS STORIES IN THE INTEGRATION OF TM

The Indian Ayurvedic medicine (Chopra, 2003) and TCM (Holland, 2000) are variously dated from about 5000 to 2000 BC, and some aspects of each have long been integrated into their respective national health care systems. Both traditions incorporate spiritual and other non-pharmacologic aspects, but in both, herbal medicine remains the major pharmacologic component.

The non-pharmacologic aspects of TCM include acupuncture, massage and Qigong - a set of physical exercises that include breathing therapy. Ayurveda also has massages, but is more famous for yoga - a form of physical exercise with spiritual components (NCCAM, 2006). Although, both Ayurvedic medicine and TCM are native to Asia, they are now practiced in many parts of the world as a form of CAM (Ninivaggi, 2008; Scheid, 2002). An account of the integration of TCM into the modernized Chinese national health care system; and the overall state of health care delivery in China are briefly described in the next section, to illustrate what can be achieved through appropriate policy, attitude and purposeful governance.

INTEGRATION OF TCM INTO A MODERNIZED HEALTH CARE SYSTEM IN CHINA

Traditional Chinese medicines play a cardinal role in China. In 2001, a total of 1249 TCMs were listed in the national essential drugs list, with sales of US$ 9.8 billion. Under the 1985 State Drug Administration (SDA) law, marketing authorization was mandatory for all drugs, including herbal remedies and other TCMs. Under this law, products marketed before 1986 could remain on the market if no adverse events had been reported. Notably, the EU and US' Acts of 2004 and 1994, earlier mentioned, borrowed a leaf from this Chinese legal provision and foresight. With effect from 1986, the process for approving new TCMs was dichotomized into: approval for clinical trial and approval for marketing. In an application for drug registration, general data; pharmaceutical data; pharmacological/ toxicological data and clinical data have to be submitted, just as shown in Table 3 for the EU. With effect from 1995, all TCMs manufacturers and marketers had to be certified by the local drug regulatory authorities. GMP and Good Supplies Practices (GSP) were basic requirements for registration and certification. In 2001,

China had 1276 drug manufacturers with GMP certification, of which 184 were TCMs manufacturers. With effect 2004, manufacturers failing to comply with GMP were shut down and all clinical trials had to be conducted in line with Good Clinical Practice (GCP) – promulgated in 1999. In 2001, there were 165 hospitals approved as clinical trial sites, of which 40 were TCM clinical trial sites. Sponsors of clinical trials could choose whichever site they preferred – provided the site and the test product had been certified by SDA. Some of the steps taken since 2001 to promote the development of TCMs, especially herbal remedies, included: promulgation and implementation of Good Agricultural Practices (GAP); institution of a registration system for processed and crude drugs; improvement of the quality and efficacy of TCMs (ICDRA, 2002). Owing, especially to the immense adaptability of TCM; the health reforms commenced in China from the 1990's to 2006; the New Rural Co-operative Medical Care System (NRCMCS) initiated in 200; and the China Health Policy Roundtable (CHPR) – support by the US' George Institute, the Chinese Government was able to bring the annual cost of medical coverage in China to a mere US$7 per person in about 2006 (Carrin et al., 1999; China Health Policy Roundtable, 2007). We turn now to Africa, which needed the Chinese model the most, even today.

THE STATUS OF TRADITIONAL MEDICINE AND HERBAL REMEDIES IN AFRICA

The importance of TM in Africa can hardly be over flogged. It is variously estimated that 80% of Africans rely on traditional herbal medicine (WHO, 2008). Indeed, a dependency of up to 90% on TM had been reported for Ethiopia (BBC News, 2006). Yet there are other more striking indicators of this high dependence. In 2004, in Kwahu district, Ghana, West Africa, there were 224 persons per traditional medicine practitioner (TMP), in contrast to 21, 000 persons per medical doctor (MD). Also in 2004, Swaziland, South Africa, there were 110 persons per TMP as against 10, 000 per MD (Conserveafrica. org, 2004). Although, South Africa, Ghana, Mali and Mauritius are ahead of the rest of Africa in furthering the modernization/ regularization of herbal remedies, the trend in these countries is nowhere near being as entrenched in the national health care system as in Asia (WHO- Regulatory situation of herbal medicine, 1998; Mills et al., 2005; Myjoyonline.com, 2008; Africa-first.com, 2010). Nevertheless, research on herbal remedies remains a vigorous area of interest in Africa's nascent biomedical research institutes, like NIPRD and CSRPM – the Ghanaian Center for Scientific Research into Plant Medicine (CSRPM, 2010). It is to be noted here in passing that Malaysia, a country that shares certain historical and biogeographical affinities with Nigeria and even Ghana, in 2001 founded her own herbal research outfit – the Herbal Medicine Research Centre (HMRC), whose mandate are identical to those of the Nigerian NIPRD, started in 1989. Be that as it may, two recent publications well exemplify the stage and character of medicinal plant research in African. First, Idu et al (2010) reported on 60 herbs sold as traditional medicine in Abeokuta, Southwest Nigeria, mostly for malaria, hypertension, typhoid, jaundice, hyperthermia, skin irritations, dysentery, anemia, gonorrhea, cough, measles and fibroid. The purpose of the study was to document the medicinal values, local names and method of preparation. The study supported the need to encourage domestication, cultivation and conservation of the herbs to ensure sustainability. The second was a study carried out in Madagascar, one of the world's most important sources of medicinal plants. There, Rakotoniriana et al. (2010) tested 23 plants for antimicrobial activity. Sixteen exhibited broad spectrum antibacterial activity, while one had a strong antifungal activity. Since the plants were mostly used against infections, the study served to confirm the basis for the folkloric use of the plants. So there is no doubt that medicinal plant research is alive and thriving in Africa. But there are certain challenges associated with traditional herbal practice in Africa, which may or may not be peculiar to the continent. Two of these, using Nigeria as an example, are described, namely: (i) poor regulation of the practice and the practitioners and (ii) the rampancy of adulteration of herbal preparations with conventional drugs (Era, 2002) like tetracycline (Etkin, 2006). These challenges have by and large accelerated the following actions: (i) invigoration and expansion of the regulatory role of NAFDAC (Akunyili, 2002) and (ii) the formulation of a TM policy for Nigeria (Lambo, 2007). The structure of that policy is the subject of Table 4. Thus, using Nigeria as an example of a developing economy, the challenges facing the nation and sub-Saharan African generally, is discussed in next section within the context of the policy described in Table 4.

THE CHALLENGES FACING HERBAL MEDICINE IN AFRICA AND THE WAY FORWARD

The need to provide detailed documentation of practices involving a given plant material

WHO (2000) stipulated that "prolonged and apparently uneventful use of a substance usually offers testimony of its safety". This means that a plant material that has been in use for 20 to 30 years or longer may qualify for clinical trials, especially if it also passed the tests for acute and long term toxicities in animals. Most herbal remedies in use in Africa today have been so utilized for centuries; therefore, the first challenge is furnish by the evidence of "prolonged and apparently uneventful use". Such evidence can be furnished by an Institute like NIPRD, or

Table 4. The structure of the traditional medicine policy for Nigeria – 2007.

Objectives, vision and goals of the policy	Scope and stakeholders of the policy	Laws for the creation and regulation of the policy	structures and strategies utilized for Implementation of the policy will the following
Objectives	**Scope**		
1. Develop and integrate TM into national health care system; 2. harness the benefits of TM for economic empowerment; 3. Extablish a country-specific institutional framework for TM.	1. Legislation and regulation; 2. Intellectual property and traditional knowledge; 3. Human resources, skills and culture; 4. Technology and finance; Conservation, biodiversity and environment; 5. Partnership between TMPs and CMPs; 6. TM in relation to culture; Education and skills; 7. Management processes; Strategy	1. Council for TM practitioners (TMPs); 2. Codes of ethics and practice for TMPs; 3. Promotion of TM via education and training.; 4.Promotion of research and development; 5. Promotion of industrial production and GMP; 6. Suitable standards for – Safety, Efficacy, and Quality control; 7. Biodiversity/ ecosystem.; 8. Indigenous knowledge and intellectual property; 9. Integration of TM to national health system; 10. Intergovernmental cooperation.	1. Nigeria's 3 tier system – Federal, State and Local; 2. Clearly defined roles and duties for each tier; 3. Clearly defined managerial processes, including ICT and information management; 4. Clearly defined leadership/ supervisory role of the Federal Government; 5. Structures of existing primary, secondary and tertiary health institutions; 6. Education and training of appropriate manpower; 7. Development resources, such as botanical gardens; 8. Research and development of appropriate technology; 9. Clearly defined budgetary provision; 10. Proper reward system for traditional knowledge.
Vision			
1. To see TM attain respectability and in harmony with CM; 2. To contribute hugely to the economy.			
Goals	**Stakeholders**		
1. To promote appropriate use of TM; 2. To reduce dependence on foreign inputs; 3. To create jobs; To produce TM products locally; 4. To build capacity in all areas of TM – cultivation, production and distribution.	1. Users of TM; TM practitioners (TMPs); 2. Researchers; Regulatory agencies; 3. Policy makers; Culture practitioners; 4. Law enforcers; 5. Entrepreneurs.		

Nigeria's interest in TM predated 1960, and is manifest in several resolutions, commissions and initiatives. Despite huge investments in conventional medicine (CM) "a majority of Nigerians still" patronize TM, especially herbal remedies. The policy was long overdue, and in tandem with the declaration of 2001-2010 as the "Decade of African Traditional Medicine" by the African Union.

by a regulatory agency, like NAFDAC; or even by a sponsor, who may be a manufacturer or marketer or a government or a philanthropist.

The services of anthropologist or historians (traditional or professional) can be employed to help authenticate oral traditions. Apparently such an approach had been practiced by Professor Etkin, working with Mallam Ibrahim Muazzam of the department of Medicinal Plant and Traditional Medicine, NIPRD (Etkin, 2006).

Once the evidence supporting a remedy has been gathered and the material proves safe from animal tests, the Research Institute, the Regulatory Agency and the Sponsor can then agree a study protocol for trial, in accordance with the guidelines presented in Table 1. As mentioned earlier, there exist registered herbalists that own their own clinics, with patients under observation; so perhaps the Institute and NAFDAC can devise a mechanism for partnering with such healers to further the cause and course of clinical research of herbal remedies in Nigeria.

Basic facilities for pre-clinical research and clinical trials

The Research Institute – the third member of the clinical research triad should have laboratories capable of carrying out the relevant tests specified in the WHO manual on quality control of medicinal plant materials (WHO, 1998b). It should also have facilities for conducting safety and toxicity studies. In addition, it should have a functional research clinic; experience with multicenter clinical trials and facilities for diagnoses and monitoring of disease states. Facilities for pharmacokinetic studies would be advantageous. It is of note however, that a recent clinical research on *Andrographis paniculata* relied only on quantification of symptoms, that is: a measure of how patients felt before, during, and after the treatment (Saxena et al., 2010). Many herbal remedies in use today can also be assessed in a similar way. Advanced techniques would of course add value to this fundamentalist approach. Clinical research on

Niprisan in 2001 relied essentially on quantification of symptoms in combination with basic histological tests (Wambebe et al., 2001). In many countries, including Nigeria, the regulatory agencies themselves have laboratories that can also run some of these tests, but deliberate policies and coordination are required to create or reinforce the enabling attitude for this approach.

Personnel and modus operandi

At least three categories of personnel are required for clinical trials: clinicians, research scientists and supporting technical staff, schooled in the fundamentals of clinical research. Indeed, in 2005, Howard University, Washington, in collaboration with Xechem Incorporated (a US based drug manufacturer) and NIPRD, conducted a training workshop at the Abuja Sheraton, attended by scores of biomedical scientists from various tertiary health institutions and drug companies in Nigeria. The themes were: (i) fundamentals of clinical trials, (ii) GMP for pharmaceutical production and (iii) how to manage clinical trials.

In the light of the foregoing therefore, NIPRD might elect to conclude the trials of Niprifan, an anti-fugal/ antibacterial agent, derived from *Mitracarpus scaber;* Conavir, an anti-HIV/ immunostimulant, derived from *Andrographis paniculata* and NIPRD AM-1, an anti-malarial agent, derived from the roots of *Nauclea latifolia.* NAFDAC may now need to be brought into active participation on these.

Conclusion

Most developing countries, especially in Africa, rely to a large extent on traditional herbal remedies, but lack the laws and organization required to optimize their comparative advantage in biodiversity and indigenous knowledge. The reverse is the case in the developed countries where trade in herbal remedies contributes substantially to their economies. While many developing countries like Nigeria, Ghana, Malaysia, Philippines and Brazil and others, are aware of the challenges and have taken various steps to address them, the fact remains that more articulate policies are needed to properly and firmly institute, modernize and regularize herbal medicine. It is especially recommended that once the conditions for clinical trials have been met, such trials should be commenced forthwith. All this will greatly augment the commendable efforts of the WHO in promoting safe herbal medicine worldwide.

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