OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA.

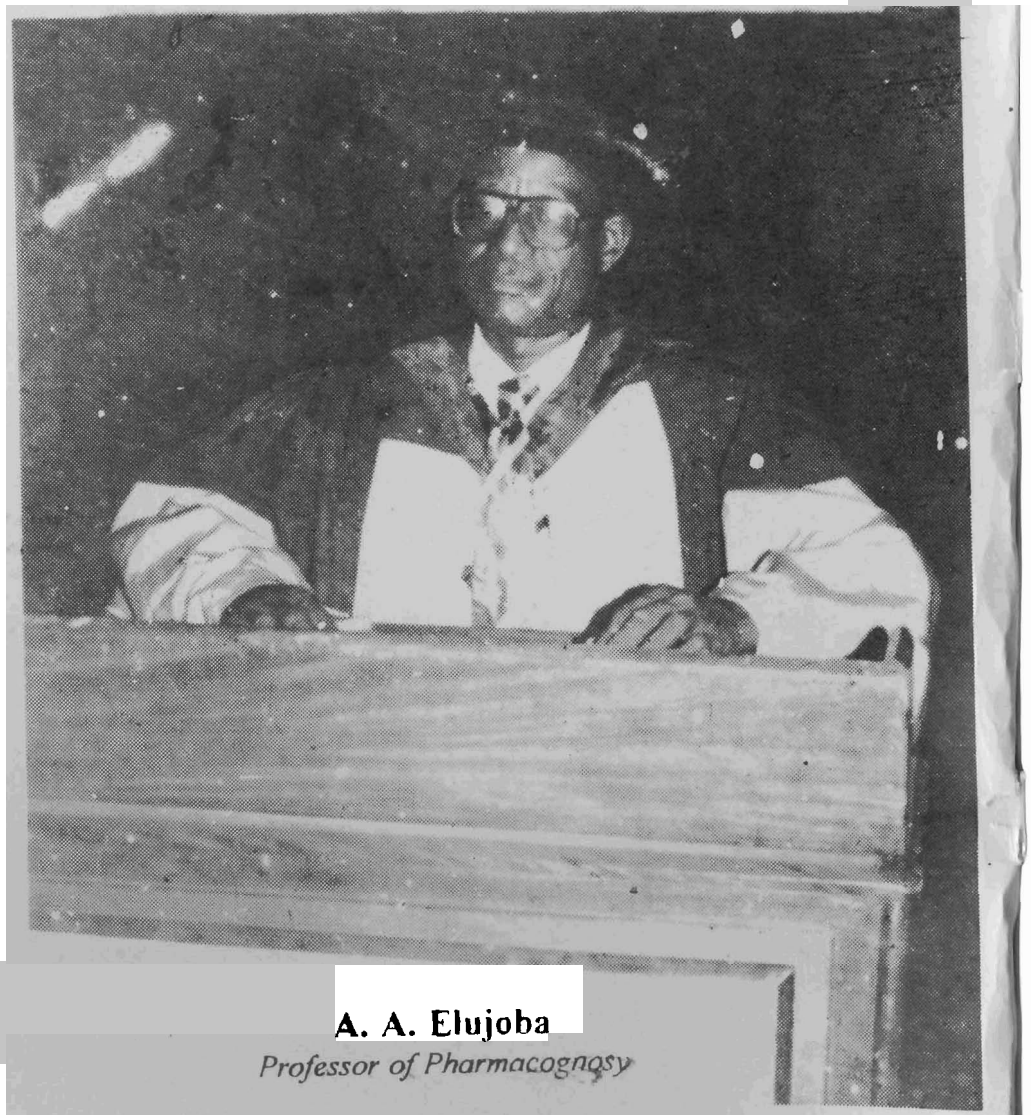
Inaugural Lecture Series 134

PHARMACOGNOSY FOR HEALTH AND CULTURE

--THE PHC 'JUNGLE CONNECTION

A. A. Elujoba
Professor of Pharmacognosy

OBAFEMI AWOLOWO UNIVERSITY PRESS LIMITED



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--THE PHC JUNGLE CONNECTION

By

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An Inaugural Lecture Delivered at Oduduwa Hall,
Obafemi Awolowo University, Ile-Ife
on Tuesday, May 11, 1999

Inaugural Lecture Series 134

Obafemi Awolowo University Press Limited
Ile-Ife, Nigeria.

Obafemi Awolowo University Press Limited, 1999

ISSN 0189 - 7848

Printed by
Obafemi Awolowo **University Press Limited**
Ile-Ife, **Nigeria.**

1. INTRODUCTION

Mr. Vice-Chancellor Sir, It is not my power, nor my might that I am what I am today, but it is all by the Glory of God. A little Catholic boy of the mid-20th century, born, bred and trained at the primary, secondary, University (Bachelor's degree and University Master's degree) levels, all obtained in Ile-Ife, is today giving all the glory to God Almighty for His Goodness and Mercy. In everlasting memory of my late sister, Mrs. Badejoko Fadero who sent me to school and whose husband persuaded me to read Pharmacy I give all honour to God who used them. Although it may appear derogatory to be referred to as a "bush man" never do we stop to think of the numerous good things that come from that bush. There are plenty of good things in the jungle. In Africa and particularly in Nigeria where rain forests thrive and flourish, our Primary Health Care (PHC) remedies lie in the jungle, in the bush and in the flora. This Great University, established for learning and culture, with all its academic excitements and the international status of being the most beautiful campus in black Africa, would not have been better situated elsewhere than in this jungle. It was my love for this "horticulturally" modified jungle that harbors the health of our people and sustains their culture that kept me away from the University of Ibadan where I was offered the Chair of Pharmacognosy and the last scale of a Professor's salary in the year 1993. For there was no greater University around than the Great Ife!

Mr. Vice-Chancellor, here is the career story of one of the pioneer guinea pigs for the development of the postgraduate programme in the Faculty of Pharmacy during the 7th decade of this century. Following an exciting and educative probationary study leave for a British Ph.D. Certificate, he faced the first set of

challenges in 1982 when I suddenly became the Acting Head of the Department of Pharmacognosy as an ordinary lecturer Grade One. The departmental leadership role came to my life when I least expected it. To the glory of God I had two Professors on the list of my staff namely: Professor Abayomi Sofowora, the first black man to be promoted Professor in our Department and today could be described as my academic mentor, and that expatriate visiting Professor of Pharmacognosy from the University of Cairo (Professor Taha El-Alfy) who subsequently became one of my co-authors. I remember with due respect those other foundation Professors of our Department who also taught me Pharmacognosy: Professor Egil Ramstad, Professor M. Kucera and Professor J. D. Kulkarni (of blessed memory). The second set of challenges came barely 5 months when I was declared a Professor of Pharmacognosy - the leadership of the Faculty of Pharmacy which also came at least 2 years earlier than I ever expected it. That both the departmental and Faculty leadership responsibilities were carried out smoothly and successfully, was attributable to the Glory of God and to the co-operation and assistance of all my staff. The latest challenges of my academic career came as the Chairman, Committee of Deans. The fine qualities and support of all my Deans have been very wonderful. Mr. Vice Chancellor Sir, from these environments of radiating academic and human love, I have emerged to present this inaugural lecture that I coined as "***Pharmacognosy for Health and Culture***".

Mr. Vice-Chancellor, the definition of Pharmacognosy was coined from the two Greek words: Pharmakon and Gignosco which imply "acquiring the knowledge of drugs" and hence Pharmacognosy can be said to be synonymous with Pharmacy itself. Simply put, Pharmacognosy can be defined as the study of crude drugs of natural origin namely: plant, animal and mineral resources, involving their proper identification, using basic

biological and chemical techniques, collection from the wild or cultivated sources, processing and storage in both crude and purified forms; the biosynthetic pathways and characterization of the active constituents, dove-tailing into the quality assessment profiles known as "Pharmacopoeial Monographs". Historically, the first drug was discovered under the umbrella of what is now known as Pharmacognosy that can be described as the origin and the biological fountain of Pharmacy. The link between Pharmacy and health is very strong. *Health* is succinctly defined by the W.H.O. as the state of complete physical, mental and social well-being and not just the absence of disease (WHO, 1946). On the other hand, *Culture* is defined generally as the sum total of the life-style, society patterns, beliefs, attitudes and commonly accepted as well as organised ways in which a community attempts to solve its life problems (WHO, 1978a). Closely linked with health and culture is Primary Health Care (PHC). *Primary_Health Care (PHC)* is the health scheme (socially and politically) conceived that suits the needs of the under-developed and greatly disadvantaged populations of the world. PHC is culturally relevant. It essentially seeks to make available equal opportunities and social justice at primary level of health facilities for the under privileged, uneducated, rural and hitherto neglected populations in the Third World Countries. A very significant element and principle of PHC declarations is the call to utilization of all the available resources including relevant cultural attributes which thus make such appropriate, accessible and moderate in cost. PHC is also essential health care based on practical, scientifically sound, socially acceptable and locally affordable methods and technology (Tella, *et al*, 1985). The title of this inaugural lecture which came as a divine revelation long before I ever became a Professor has interpreted "Pharmacognosy" as ***the study of crude drugs from medicinal plants that are found in the Jungle and are used by our people to promote health at the Primary Health Care (PHC) level through the practice of***

traditional medicine, which is our culturally accepted heritage. What a perfect connection! The Vice-Chancellor sir, ladies and gentlemen, **"*PHARMA*COGNOSY FOR *HEALTH* AND *CULTURE* - THE *PHC* JUNGLE CONNECTION"**

The need to include traditional medicine in PHC is based on many factors

- The traditional healers are familiar with the socio-cultural background of the people in the same community.
  They are highly respected and experienced in their work even though the art may have been passed from generation to generation and irrespective of their defects or deficiencies of their practice,
  Their services are less expensive than orthodox,
  The distance from the rural areas to the nearest orthodox hospital is enormous for the sick people and they speak the same language with the patients in the same communities.

Mr. Vice-Chancellor sir, following that brief background on the socio-academic perspective of my life in this great institution and a brief introduction on the coverage of the title of this inaugural lecture, permit me, to now give some selected findings of my research efforts which together tell the complete story.

PHARMACOGNOSY AND THE SCIENCE OF TRADITIONAL MEDICINE

(a) The Conceptual Background

The early man was very curious about the environment he found himself as exemplified by the life of Adam and Eve in the beautiful Garden of Eden. The pre-historic man therefore depended

on plants as medicinal remedy in times of ill-health, as well as protective devices from evil forces in times of despair and insecurity. The use of medicinal plants therefore dates back to the beginning of creation and the original knowledge came through trial and error by the primitive man who distinguished between food; medicinal and poisonous plants. Some knowledge also came by observation especially by the hunters and housewives on the animals that voluntarily consumed such plant. Traditional medicine is an integral part of the tradition or culture of each country or society and thus has a heritage of community acceptance. Many simple family therapies are practiced in different communities, the knowledge and skill of, which are kept secret within the families, or Communities. These have been in use for hundreds of years and must therefore be effective in many instances otherwise, they would have not survived the test of time. The practices involved vary widely in keeping with the social and cultural heritage of different countries. In many developing communities, it remains the only available and affordable health service for the majority of the population providing a first-line and basic health care system for the people living in those communities.

Until the 19th Century, medicine consisted exclusively of what is known today as traditional medicine. From the historical fact of colonial expansionism, and in the name of an erroneous conception of the universality of science, Europe exported and imposed on other parts of the world (particularly Africa), its modern scientific medicine. It also attempted to discredit or ban traditional medicine in its colonies. In self-defense and to ensure survival, African traditional medicine took refuge over a long period which slowed down its progress and development (WHO, 1984). Even when countries of the world overwhelmingly embraced modern medicine, traditional medicine continued to be used by the rural populations who saw the practice as an intimate combination of

physical, mental, social, moral and spiritual well-being. It therefore assumed the 'pluridimensional' characters of health, disease and treatment.

(i) *What is Traditional Medicine?*

The World Health Organization (1978b) has defined traditional medicine as the total combination of knowledge and practices whether explicable or not, used in diagnosing, preventing or eliminating a physical, mental or social disease. These knowledge and the practices may rely exclusively on past experiences and observations handed down from generation to generation verbally or in writing. The practices are predicated on the original concepts of nature which include the material world, the sociological environment whether living or dead and the metaphysical forces of the universe (WHO, 1978b). It can also be taken as the sum total of practices, measures, ingredients and procedures of all kinds, whether material or not, which from time immemorial has enabled the African to guard against disease, to alleviate sufferings and to cure himself.

(ii) *Explicable Form of Traditional Medicine*

This is a form of traditional healing method utilizing medicinal substances whose actions and potencies can be probed scientifically and can be explained pharmacologically on appropriate animal model. It is an acceptable form whose explanation can be evolved from experimentation, observation and inference. It represents the direct use of herbs or other substances for the treatment of diseases in the same way aspirin can be used for analgesic purposes.

(iii) *Inexplicable Form of Traditional Medicine*

This is a form of traditional healing method involving

mystical, magical, psychic, supernatural, metaphysical and occultic practices to cause healing or evil. This form cannot be scientifically probed within the limits of today's scientific advancement. Actions brought about by this form cannot be explained by any known physical theories. It is the most controversial and dreaded practice whose explanation goes beyond any human intelligence or any intellectual comprehension. The uses of incantations or diagnosis by oracular or divine consultation as well as ritual sacrifices belong to this form.

(iv) *Herbal Medicines:*

They are finished and labeled medicinal products that contain, as active ingredients, aerial or underground parts of plants or other plant material or combinations thereof, in the crude state or as plant preparations. Plant materials could include juices, gums, fatty oils, essential oils and any other substances of this nature and herbal medicines may contain excipients in addition to active ingredients or also natural organic or inorganic active ingredients which are not of plant origin (WHO, 1991). Herbal medicine can exist either as mono - or multi-component mixtures consisting one to several plant materials. It is an explicable form of traditional therapy.

(v) *Traditional Medical Practitioner (TMP)*

A traditional medical practitioner or traditional healer is a person who is recognised by the community in which he lives as competent to provide health care by using vegetable, animal and mineral substances and certain other methods which are based on social, cultural and religious backgrounds as well as on the knowledge, attitudes and beliefs prevalent in the community with respect to physical, mental and social well-being and the causes of diseases and disabilities (WHO, 1978a). Thus a traditional healer serves and is taken by the community as being responsible for their well-being in health and disease state and can be said to serve as the

physician, the pharmacist, the nurse, the physiotherapist etc.

There are about 200,000 traditional healers in Nigeria. They comprise herbalists (specialists in herbal medicine), traditional birth attendants (specialists in traditional obstetrics), traditional psychiatrists (for management of mental illness), traditional surgeons (carrying out circumcision, tribal marks, etc.), incantators (making use of the power of words for healing), herb dealers (women selling raw materials for herbal medicine), bone setters (traditional orthopaedic experts), spiritual or faith healers (utilising Christian religion for faith healing) and Koranic healers (using Islamic religion for faith healing). Other practitioners imported into the country include homeopaths, naturopaths, osteopaths, acupuncturists, metaphysicians, etc. (Tella *et al.*, 1985). These specialists are more correctly referred to as alternative therapists. Of all the specialist areas, the herbalists, the traditional birth attendants, the traditional psychiatrists, the bonesetters and the faith healers appear indispensable in the physical, mental and social well being of the local community.

Traditional bonesetters can be likened in practice and service to the modern orthopaedic surgeon. Their services are most useful in very distant rural community where modern orthopaedic services can not be reached easily. Travelling long distances would cause more trauma and pains to the orthopaedic patients. A spectacular aspect of their services involves breaking similar bones of a local fowl provided by the patient. Healing of the broken bone of the patient is monitored and is believed to correspond to the healing taking place in the fowl. Although incantations are often involved, this practice sounds logical and rational. While the traditional bone setters may be de-limited in some treatment and manipulative respect, they continue to play a prominent role in fracture management as long as our hospitals are unable to provide adequate care for fracture patients (Oginni, 1995). This will be true as long as such hospital services are not accessible, acceptable,

affordable and available at the doorsteps of the rural population (Elujoba, 1995).

The Christian faith healers of all types and categories ranging from prophets to pastors, from evangelists to archbishops can play an indispensable role especially in psychiatry, counseling, healing, and spiritual stability of our people. They achieve these by prayers, fasting, use of holy water, candle burning, praise worshipping and thanksgiving. Millions of Nigerians today, especially women are faced with one problem or another, be it economic, physical, domestic or spiritual bondage by the human enemies or by the devil. They move from churches to churches, from night vigils to mountaintops, from streams to rivers and from different deliverance to redemption services. Most common of all the problems are related to marriage encounters, promotion, poverty, sickness, (particularly barrenness) as well as spiritual warfare. It is uncertain if faith healers can be correctly referred to as traditional healers or alternative medicine practitioners.

(vi) *Advantages And Disadvantages of Traditional Medicine*

Traditional healers provide cheap, affordable, acceptable and accessible healthcare services within their communities. For over 85% of the population (especially in developing nations), traditional medicine still serves as the main form of health care available (WHO, 1986a). The therapy blends normally with the culture since the practitioners often include folklore, customs, appeasement, charms and incantations (Ghani, 1986). The practitioners represent a large stock of unrecognised medical manpower whose medicinal substances stand as potential sources of new and useful therapeutic agents. In cases where their premises are not the first points of call, they remain the only alternative appeal whenever patients have failed to get cured of any disease in the orthodox hospitals.

The various disadvantages of traditional medicine have come in form of criticisms, shortcomings and inadequacies levied against the traditional healers by orthodox practitioners. Illiteracy is an obvious handicap as they rely mostly on memory and hence are vulnerable to medical errors in diagnosis and prescription (Elujoba, 1991). Their premises and mode of preparation of their remedies have shown that hygiene is not a priority and hence there are infection possibilities imbibed in their practices. A major criticism is the lack of standardization ethics in dosaging, general practice and training which may lead to potential toxicity and regular therapy failure. The practice of inexplicable form of traditional medicine with a different concept from modern medicine represents another strong disadvantage as it could frustrate collaboration logistics between the practitioners of the two systems. Actually, the major worries against traditional healers by the orthodox practitioners are inferiority and illiteracy, secrecy and exaggeration, unscientific and unstandardized medical training and remedies, quackery and witchcraft. On the other hand, the major worries against the orthodox practitioners are also inferiority and pride, fear of competition and selfishness, greed and hatred, immaturity and jealousy. From my interactions as moderator between the two systems, I believe that acquisition of additional knowledge on both sides, leading to better results through complementary efforts and referral cordiality will serve as major areas of mutual benefits and should be exploited.

Moreover, a good number of these disadvantages and worries may have been removed due to civilization and retraining exposures occasionally being organized by some Local Government Authorities. In any case and indeed if traditional medicine had been exploited as much as it is being neglected, African would have become the third super-power rather than the third world. If the African Continent is to be unique in anything, it will not be in the development of nuclear weapons, or in the race to occupy the moon and stars, our

conquest of the world can come through the development of the inherent culture such as traditional medicine. Acupuncture was part of Chinese medical culture previously unacceptable to the outside world, but today having been scientifically proven, it is the most wonderful techniques of anesthesia attracting a lot of foreign exchange to China.

(vii) *Demographic Assessment of Traditional Medical Practitioners and their Practices*

We have carried out a demographic survey using questionnaire-based methods among the Traditional Healers in some strategic Local Government Areas of Ondo, Osun and Lagos States with a view to collecting data on their knowledge, attitude and practice (Elujoba and Ajayi, 1998) and also in Imo, Abia, Anambra and Enugu States (Elujoba and Inya-Agha, 1999). The following interesting findings are noteworthy:

- the traditional healers are more concentrated in the rural than in the sub-urban or urban areas of the Local Governments with more than 60% of them above 70 years of age and majority being male practitioners;
- generally, about 50% of the Traditional Medical Practitioners (TMPs) were fairly educated and the mean length of experience was between 30-60 years;
- over 90% of them acquired their knowledge of traditional medicine by parental inheritance, and only very few by apprenticeship;
- majority of them use their residence for clinics and over 50% had access to potable water with only a minority with no form

of human waste disposal system at all;

- the premises were generally clean and tidy with good ventilation and a good number of patients patronize them daily for various forms of diseases;

- most of the healers (between 80%-90%) use herbs only for management of diseases, only a very few combine non-medication therapy.

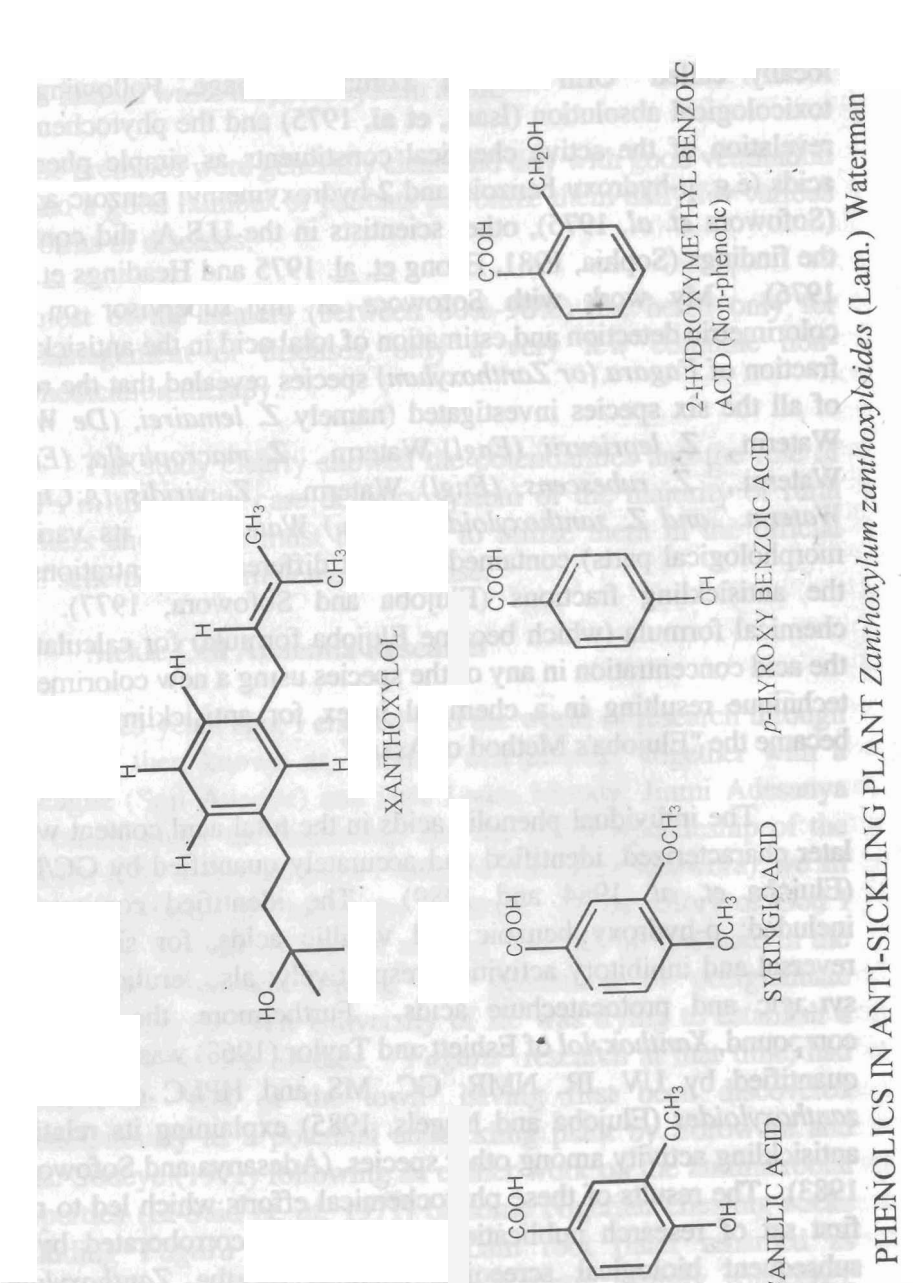
The study clearly showed the potentialities and the role of TMPs in the health care delivery system of the majority of rural dwellers and efforts must be made to utilize them in the official PHC scheme in a complementary sense.

(b) Sickle Cell Anaemia Research

Precisely 25 years ago, I entered into the world of research through what was then known as "*Fagara discipleship*" together with a colleague (Soji Adeoye) and later Lanre Moody, Jinmi Adesanya and others under the leadership and the Chief Apostleship of the then Dr. E.A. Sofowora (now Professor Abayomi Sofowora), we all thrived as Master of Philosophy students. To the Glory of God I became the foundation student and the first M.Phil graduate in the Faculty of Pharmacy among that generation of postgraduate students when the then University of Ife was trying to establish a College of Graduate Studies. *"Fagara"* research at that time, had become the "talk of the town" having first been discovered serendipitously as a potential antisickling plant by Sofowora and Isaac-Sodeye (1971) following an earlier work on the antimicrobial properties (El-Said *et. al.* 1971) of some Nigerian chewing sticks including *Fagara zanthoxyloides* Lam root (later renamed as *Zanthoxylum zanthoxyloides* (Lam.) Waterm. (family Rutaceae),

locally called "Orin ata" in Yoruba language. Following its toxicological absolution (Isaac, et al, 1975) and the phytochemical revelation of the active chemical constituents as simple phenolic acids (e.g. p-hydroxy benzoic and 2-hydroxymethyl benzoic acids) (Sofowora *et. al.* 1975), other scientists in the U.S.A. did confirm the findings (Sophia, 1981, Ekong et. al. 1975 and Headings et. al., 1976). My work with Sofowora as my supervisor on the colorimetric detection and estimation of total acid in the antisickling fraction of *Fagara (or Zanthoxylum)* species revealed that the roots of all the six species investigated (namely *Z. lemairei, (De Wild)* Waterm., *Z. leprieurii, (Engl)* Waterm., *Z. macrophylla, (Engl)* Waterm., *Z. rubescens, (Engl)* Waterm., *Z. viridis (A.Chev.) Waterm. and Z. zanthoxyloides (Lam.) Waterm.* and its various morphological parts) contained acids at different concentrations in the antisickling fractions (Elujoba and Sofowora, 1977). A chemical formula (which became Elujoba formula) for calculating the acid concentration in any of the species using a new colorimetric technique resulting in a chemical index for antisickling activity became the "Elujoba's Method of Assay".

The individual phenolic acids in the total acid content were later characterized, identified and accurately quantified by GC/MS (Elujoba *et. al*, 1984 and 1989). The identified compounds included: p-hydroxy benzoic and vanillic acids, for sickle cell reversal and inhibitory activities, respectively; also ferulic, caffeic, syringic and protocatechuic acids. Furthermore, the phenolic compound, *Xanthoxylol* of Eshiett and Taylor (1968) was found and quantified by UV, IR, NMR, GC, MS and HPLC only in *Z. zanthoxyloides* (Elujoba and Nagels, 1985) explaining its relative antisickling activity among other species, (Adesanya and Sofowora, 1983). The results of these phytochemical efforts which led to my first set of research publications in life were corroborated by a subsequent biological screening exercise on the *Zanthoxylum*



(Fagara) species showing varying degrees of antisickling activity in line with varying degrees of acid content (Adesanya and Sofowora, 1983) with *Z. zanthoxyloides* being the most active.

Our research in the same field on the Antisickling activity of *Adansonia digitata* L. Bombacaceae (Yoruba: Ose) reported only a low reversal antisickling activity but no inhibitory action was observed, (Adesanya, Idowu and Elujoba, 1988).

Sickle-Cell Disease (SCD) is a common inherited and genetic disorder of haemoglobin arising from a marriage between two carriers of the haemoglobin S to produce an Haemoglobin SS homozygous or Haemoglobin SC individual at birth. The disease cannot be cured but its various and variable manifestations can be effectively treated and often prevented, in order to allow the affected individual to live a normal, long and useful life. Probably because of many different clinical manifestations of the disease, to take care of the acute problems such as vaso-occlusive horror leading to painful eventualities, aplastic crisis, stroke, priapism (i.e. an uncontrollable erection and turgidity of the male organ), transfusion emergencies, chronic complications of the bone, eye, lungs, kidney, delayed puberty, contraceptive and pregnancy requirements, a global approach involving a stand-by team of medical specialists has been proposed by W.H.O. (1991a). Such a multi-disciplinary team must essentially consist of paediatricians, haematologists, specialist nurses, psychologists and orthopaedic surgeons. For the psycho-social support team, a psychiatrist, a social worker, the school teacher and the parents would make a suitable composition whose efforts should concentrate on preparing the individual for the highest achievable level of work rather than giving him or her undue privileges that could lead to continued life dependency.

The current figure for the total number of worldwide

incidence by population is more than 463,124,000 people (Sickle Cell Foundation, U.S.A., 1990). Nigeria, the giant of Africa in many respects, houses about one in every four individuals (25% of the population) being carriers of the abnormal haemoglobin S gene (i.e. Haemoglobin AS genotype) and about 25 million Nigerians are sickle cell anaemia individuals. Hence, within the last 30 years, the scientific literatures have brought Nigeria to the limelight, among other African nations, in the field of Sickle Cell anaemia research. Closer reflections on this status especially in this country, would reveal not only complimentary limelight but also unhealthy and unwise controversy coupled with distrust and unscientific inclinations which have kept the *"Fagara"* research undeveloped and unutilized despite proofs of efficacy, safety, standardization and patent security (Isaac *et al*, 1975, Adeoye and Sofowora, 1978). The same story applies to similar report by Fadulu,(1970) based in the U.S.A. (Sickle Cell Foundation Report, 1990) and subsequent isolation of a compound by him from the same *Zanthoxylum (Fagara)* root which up till today has been coded NX066999 most probably for fear of undue controversy and piracy, despite some concluded clinical trials. The report by Shode and his co-workers in the Biochemistry Department of the University of Port-Harcourt (Ekeke and Shode, 1985) that the edible bean *Cajanus cajan* (Leguminoceae) possessed antisickling activities ought to have been more enthusiastically embraced especially when the active constituent was found to be phenylalanine amino acid. Would it also have been infected by the *Fagara* controversy, otherwise why would it not have been developed into a drug by now? Yet another example is the name NIPRISAN, an herbal antisickling remedy discovered at the National Institute for Pharmaceutical Research and Development (NIPRD) in Abuja. It has been reported to be effective and safe having been used clinically on volunteers with promising results (Wambebe, 1997). Alas, up till the time of this lecture, the name of the plant used for NIPRISAN has been kept

secret and confidential most probably for fear of unhealthy controversy and piracy. A good number of traditional remedies brought to our laboratories including a substance used by the speaker's mother for seasonal rheumatic pains and have shown promise *in vitro* against the sickling phenomenon, could not be published because of the restricted information possibly for fear of unhealthy controversy and piracy. An unknown antisickling herbal medicine called siculine was bought by a research group in the North and was found to possess sickle inhibitory and analgesic activities (Ejiofor *et al*, 1998). Although that was a blind research, it showed the level of seriousness of the trend. Several other Nigerian Scientists today may have been discouraged in publishing their research findings in sensitive areas like sickle cell anaemia or HIV/AIDS research for fear of controversy, unhealthy rivalry and piracy. Meanwhile, the poor patients continue to suffer, apparently in the midst of plenty. It is envisaged that a dawn will accompany the next millennium when our scientists will change heart by accepting discoveries with an open mind. Hence, it is my considered opinion that the above four groups of Nigerian Scientists that reported discoveries in antisickling research should come together and corporately select the most active of these plants for the development of an effective and safe antisickling agent for Nigeria.

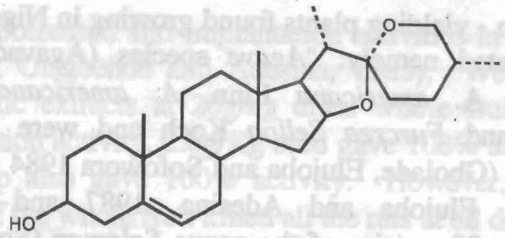
(c) Fertility Regulation Research

(i) *The Oral Contraceptives*

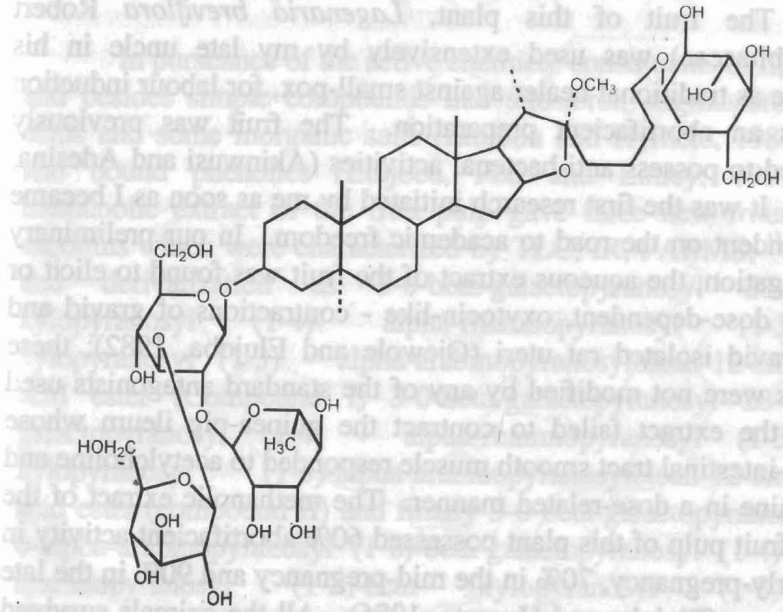
One of the outstanding aims of the steroid industry is to reverse or negate the biblical indulgence of "increase and multiply and fill the earth" apparently with human beings. Economic planners believed that birth rate was by far greater than life extinction or death rate (Ewell, 1964) and that if this injunction was

followed rigidly, there would be a population explosion in many countries of the world including Nigeria. The steroid industry has thus provided drugs that prevent ovulation or fertilization and thereby reducing pregnancy chances. Such steroid drugs which were usually obtained through diosgenin from plant sources followed by Marker's degradation (Marker and Applezweig, 1949) became the second leg in my research career under the supervision of Dr. Roland Hardman in the United Kingdom. The trend was to look for high-yielding plants for steroidal sapogenins particularly diosgenin (?-(25R) - spirosten - 3-beta - ol) which was obtainable following direct acid hydrolysis of the seed of fenugreek i.e. *Trigonella foenumgraecum Linn.* (Family Fabaceae) containing the precursor saponins called furostanol glycoside eg. (25S) - 22-0-methoxy-5 alpha -furostan-3 beta -22,26-triol 3-0-alpha - rhamnopyranosyl (1 - 2)-beta -D-glucopyranosyl (1 - 3)-beta -D-glucopyranoside-26-0-beta -D-glucopyranoside (Hardman, Kosugi and Parfitt, 1980).

I was given a challenge of obtaining high yields of diosgenin from the same seed without using any acid. The best incubation conditions without and prior to acid hydrolysis were studied using either endogenous or exogenous enzymes alone (e.g. Narriginase) or both endogenous plus exogenous enzymes giving a 90% increase in yield of monohydroxysapogenins calculated as diosgenin (Elujoba and Hardman 1985a and 1987a) when whole seed was used but up to 200% increase could be achieved when powdered seed was used for the assay (Elujoba and Hardman 1985b). The active endogenous enzymes in the seed of fenugreek were extracted and purified as beta-D-glucopynosidase, alpha-D.galactopyranosidase, alpha-D-mannopyranosidase and beta-D-mannopyranosidase (Elujoba and Hardman, 1987b). Fenugreek seed was cultivated in Nigeria weather to give higher yield of diosgenin than imported samples (Elujoba, 1987 and 1993). Other



DIOSGENIN (from *Trigonella foenumgraecum*)



FUROSTANOLOL GLYCOSIDE IN FENUGREEK (*Trigonella foenumgraecum*)
(25S)-22-O-Methoxy-5α-furostan-3β-22,26-triol, 3-O-α-rhamnopyranosyl (1-2) -β-D-glucopyranosyl (1-3)-β-D-glucopyranoside-26-O-β-D-glucopyranoside

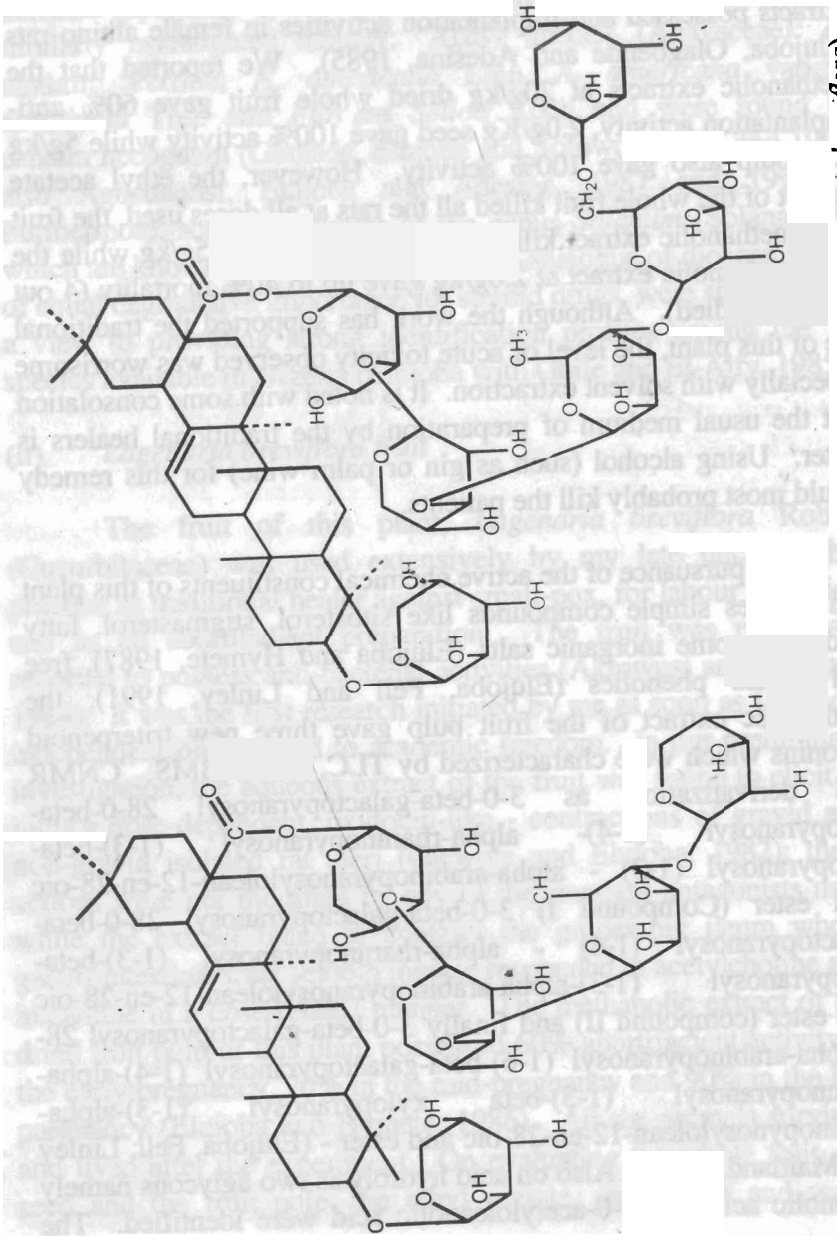
steroidal sapogenin - yielding plants found growing in Nigeria were similarly investigated namely: "*Agave* species (Agavaceae): *A. sisalana* Perrine, *A. americana* Linn, *A. americana* variety *marginata* Trel. and *Furcrea Selloa* Koch and were found to contain hecogenin (Gbolade, Elujoba and Sofowora 1984 and 1992 also Agbedaunsi, Elujoba and Adesina, 1987 and 1990). Furthermore, some 30 species of the genus *Solanum* (Solanaceae) which are known to produce the nitrogen-analogue of diosgenin and of equal degradative importance for steroid drugs, were studied with a view to providing strong identification profiles among the 33 species available in Nigeria (Elujoba with Gbile and El-Alfy, 1985).

(ii) *Lagenaria breviflora fruit*

The fruit of this plant, *Lagenaria breviflora* Robert (Cucurbitaceae) was used extensively by my late uncle in his practice as traditional healer against small-pox, for labour induction and as an abortifacient preparation. The fruit was previously reported to possess anti-bactenal activities (Akinwusi and Adesina, 1984). It was the first research initiated by me as soon as I became independent on the road to academic freedom. In our preliminary investigation, the aqueous extract of the fruit was found to elicit or induce dose-dependent, oxytocin-like - contractions of gravid and non-gravid isolated rat uteri (Ojewole and Elujoba, 1982); these actions were not modified by any of the standard antagonists used while the extract failed to contract the guinea-pig ileum whose gastro-intestinal tract smooth muscle responded to acetylcholine and histamine in a dose-related manner. The methanolic extract of the dried fruit pulp of this plant possessed 60% abortifacient activity in the early-pregnancy, 70% in the mid-pregnancy and 90% in the late pregnancy (Elujoba and Hymete, 1986). All the animals survived and lived after the experiment. On evaluating the whole fruit; the seed and the fruit pulp, the ethyl acetate, methanolic and water

extracts possessed anti-implantation activities in female albino rats (Elujoba, Olagbende and Adesina, 1985). We reported that the methanolic extracts at 20g/kg dried whole fruit gave 60% anti-implantation activity, 2.0g/Kg seed gave 100% activity while 5g/kg fruit pulp also gave 100% activity. However, the ethyl acetate extract of the whole fruit killed all the rats at all doses used, the fruit pulp methanolic extract killed one out of 10 rats at 5g/kg while the seed methanolic extract at 2.0g/kg gave up to 40% mortality (4 out of 10 rats died). Although the work has supported the traditional use of this plant, the level of acute toxicity observed was worrisome especially with solvent extraction. It is noted with some consolation that the usual medium of preparation by the traditional healers is water. Using alcohol (such as gin or palm wine) for this remedy would most probably kill the patients.

In pursuance of the active chemical constituents of this plant and besides simple compounds like sitosterol, stigmasterol, fatty acids and some inorganic salts (Elujoba and Hymete, 1987), free and bound phenolics (Elujoba, Fell and Linley, 1991), the methanolic extract of the fruit pulp gave three new triterpenoid saponins which were characterized by TLC, IR, FABMS, ^{13}CNMR and derivatization as 3-0-beta-galactopyranosyl 28-0-beta-xylopyranosyl (1-4)- alpha-rhamnopyranosyl (1-3)-beta-xylopyranosyl (1-3) - alpha-arabinopyranosylolean-12-en-28-oic acid ester (Compound I) 3-0-beta-galactopyranosyl 28-0-beta-galactopyranosyl (1-4) - alpha-rhamnopyranosyl (1-3)-beta-xylopyranosyl (1-3)-alpha-arabinopyranosylolean-12-en-28-oic acid ester (compound II) and finally 3-0-beta-galactopyranosyl 28-0-alpha-arabinopyranosyl (1-6)-beta-galactopyranosyl (1-4)-alpha-rhamnopyranosyl (1-3)-beta xylopyranosyl (1-3)-alpha-arabinopynosylolean-12-en-28-oic and ester - (Elujoba, Fell, Linley and Maitland, 1990). Also on acid hydrolysis two aglycons namely Oleanolic acid and 3-0-acetyloleanolic acid were identified. The



SAPONIN II (from *Lagenaria breviflora*)

SAPONIN I (from *Lagenaria breviflora*)

saponin mixture was linked with the anti-implantation activities (Ibironke with Elujoba, 1997) while the abortifacient and oxytocic actions were attributed to the inorganic salts in massive concentrations in the fruit pulp (Elujoba and Hymete, 1987)

(iii) *Gossypium barbadense seeds*

Gossypium barbadense Linn. (Malvaceae) known as cotton seed plant produces cotton seed oil for cooking in some parts of the world including Nigeria. It contains a polyphenol bis-sesquiterpene known as gossypol which has been proposed in China as a male contraceptive (Xue *et al,* 1980). There has been consistent call for the development of male antifertility agents in preference to predominant advances in female fertility regulating substances. We investigated crude methanolic extracts of the cotton seed after de-ionization on Amberlite cationic exchange resins. The processed extract resulted in an aqueous solution containing crude gossypol which was given to adult male rats in varying concentrations and the rats were sacrificed at different times and examined histologically. Plasma Follicle Stimulating Hormone (FSH) and Luteinizing Hormones (LH) showed no changes (Elujoba with Thomas *et al*, 1991). However, plasma testosterone was lower than the control while testicular histology showed early germ cell disorganization followed by progressive fibrosis by the first 24 hours with evidence of recovery by 168 hours. Cottonseed meal can therefore rapidly cause damage to testicular, liver, kidney and muscular tissues in its functioning as a male contraceptive agent.

(iv) *The Role of Traditional Birth Attendants (TBAs)*

A traditional birth attendant (TBA) can be described as a traditional healer who, having specialized in women's problems in relation to fertility, pregnancy, pre - or peri - and post-natal care,

discharges such services within the local communities using expertise based on tradition, religion, culture, appeasement, folkloric customs and charms. In Nigeria, two major groups of TBAs can be identified:

(1) those who use the above traditional method of obstetrics and gynaecology for their practice and practice as part-time having inherited the art from their predecessors and

(2) those who use only Christian religious methods in their practices based on prayers, fasting, holy water, spiritual oils, incense and candle-burning and also practice as full-time essentially versed in fundamental Christian faith and their clinics as a rule are affiliated to the church administratively. It is not clear if this group, being proposed as Christian Birth Attendants (CBAs) could be justifiably referred to as TBAs.

Female Infertility

Female infertility is considered very serious to any intending couple within the Nigerian communities that believe that the essence of any wedlock and the primary function of a wife is procreation. Children are of such vital importance in our culture that the affected couples can do virtually anything to look for them. The premium placed on childbearing is so great that other social influences such as love, sexual gratification and religion are secondary. Therefore, an infertile wife can be divorced since in most cases of barrenness, the fault is always ascribed to the wife who is exposed to derogatory names, societal contempt, ridicule and blackmail within the community. She is therefore always unhappy and often depressed.

The main socio-cultural background as regards female infertility obtained from a questionnaire-based ethnomedical field study in the South-West of Nigeria (Elujoba, 1995) has revealed a

number of major causes of infertility besides pathological factors. These include harmful cultural procedures of female circumcision at youth with consequential anatomical damages to the uro-genital system and later impair fertility, home-based pregnancy and peri-natal care by unskilled community leaders, harmful gynaecological practices by the TBAs. Others are lack of moral and psychological supports by the community, the cultural system of polygamy in which sexual intimacy is pre-arranged among the wives on a rota basis, cultural denial of reproductive rights such as childhood marriages, leading to sexual and emotional stress, and finally the common cultural belief in spiritual and occultic causes of infertility e.g. witchcraft which can complicate treatment and may unnecessarily delay moves to seek modern health therapy

The role of the TBAs in diagnosis and management of various forms of female fertility problems e.g. menstrual disorders, worms in the womb ("Aran Inu; aran latantatan; aran kinisa and aran yoyunyoyun"), post-coital seminal expulsion ex-vaginalis or leucorrhea ("Eda"), heat in the womb ("Ooru inu") and Fibroid ("Iju"), using different plant materials as remedies was assessed. They were found to consist of 32 medicinal preparations comprising 43 plant species of about 33 plant genera from up to 27 plant families.

We conducted another survey among 14 Christ Apostolic Church (CAC) maternity centres in Ile-Ife, consisting of in-depth interviews with the senior resident Church Birth Attendants (CBAs) and also the inventory of the available clinical facilities in the centres (Okonofua, Elujoba with others, 1995). We found that the maternity was often located within the Church premises and managed by a resident female birth attendant in each case with age range of 30-60 years (median 45 years), mostly married with at least 4 living children. Many have up to primary school education while

the others are illetrate. Only a few had modern school education. Less than a quarter could read and write. Most CBAs received basic training in antenatal care and delivery from courses offered by the Church with subsequent retraining exposure organized by the Ife Central Local Government. Annual deliveries per centre ranged between 11 and 170 children. Fees charged for antenatal care ranged between 0 and 10 naira (mean 5 naira) only, without any charge at all for delivery. Clinically, only a few used sterile gloves for vaginal examination but many cut umbilical cord with disinfected pair of scissors or a new blade and tied the cord with disinfected thread or clips. However, the referral rate to modern health institutions was very low, relying only on prayers for management of difficult deliveries. None of the CBAs used any drugs during pregnancy and labour, none could describe the 3rd stage of labour clearly. These findings suggest the need for upgrading the status and contribution of the CBAs with more adequate retraining in order to reduce some elements of already identified predictors of maternal and perinatal mortality in Nigeria namely: non use of hospital antenatal care facilities (Harrison *et al*, 1985), delay in seeking medical help in referral (Okonofua *et al*, 1992) and attendance to delivery by unqualified personnel (Adetoro, 1987).

The re-training programmes already embarked upon by the Federal Government have aimed at improving the services of TBAs by discouraging the harmful, socio-cultural elements and medico-technical tools as well as inculcate in them, the spirit of referral system. It is strongly believed that this intervention will be more vigorously pursued in order to remove the danger of their practices and make the TBAs safer and better participants in the primary health care delivery system (Ransome-Kuti *et al*, 1991).

(d) Studies on the Nigeria Cassia Species

One of the main criteria for investigating any particular African medicinal plant for drug development is the quest for cheaper source of existing official drugs as substitutes. Substitution of local raw materials for drug manufacture is of great importance due to the worldwide economic depression. The study of the Nigeria *Cassia* species for laxative activity by my team falls squarely under this category. Our aim was to examine the 33 different species or more of *Cassia* plants available in this country (more than 10 of which are found growing on this campus as horticultural features) with a view to selecting the most active species as a substitute for imported laxative drugs in Nigeria. Presently our country spends a lot of the meagre foreign reserves on the importation of laxative drugs mostly Senna leaf (*Cassia acutifolia* Delile or *Cassia angustifolia* Vahl. family Leguminoceae - Caesalpinoideae) and in form of the pods (known as Senokot tablets). We have screened over 10 species growing in different locations in Nigeria resulting in 5 Masters degree Theses supervised by me both in this University and in the University of Benin (Iweibo, 1986, Ajulo, 1987, Ogunti, 1992, Abere, 1998, and Akanmu, 1999).

The biological studies, using male albino rats which, on feeding with the hot infusion of the plant material, giving considerable number of wet faeces compared to dry faeces (an indication of laxative action) using senna (herb tea) as a reference standard, showed that *C. alata* leaf (Ogunti and Elujoba, 1993), C. podocarpa leaf (Elujoba and Iweibo, 1988), the fruits of *C. fistula*, *C. podocarpa* and *C. alata* (Elujoba and Abere, 1998) could be used for laxative drug development in this country. Any *Cassia* species that produces at least 50% wet faces within 12hours of oral

administration into rats using our procedure can be said to possess a significant laxative activity. Therefore, the Biological Senna-Equivalent or the % Senna-Activity formulated and proposed by us (Elujoba *et al*, 1989 and 1993) as an index of comparison was defined as the quotient of the dose of that *Cassia* species and of Senna in mg/kg, respectively which produced 50% of total faeces as wet faeces within 12hours of oral administration under the same experimental procedure. The % Senna-Activity is derived by multiplying the Biological Senna-Equivalent by 100. Hence in order of potency at 500mg/kg, *C. fistula* fruit gave Biological Senna-Equivalent of 1.03, *C. podocarpa* leaf gave 0.90, *C. podocarpa* fruit 0.88, *C. alata* leaf 0.70, *C. alata* fruit 0.53, *C. sieberiana* fruit 0.53, *C. alata* leaf 0.50, *C. occidentalis* fruit 0.43, *C. hirsuta* fruit 0.38 and *C. siamea* fruit 0.10 while *C. acutifolia* and fruit gave 1.30 and 1.00, respectively (Elujoba *et al*, 1989 and Elujoba with Abere, 1999). The principal laxative chemical constituents of purgatives from plants belong to the anthraquinous derivatives (Rai, 1978) and our investigation showed that the leaf of *C. alata, C. fistula, C. hirsuta, C. occidentalis, C. podocarpa, C. rotundiflora, C. siamea,* and *C. tora,* gave the percentage contents of combined arthraquinones as 1.32, 0.04, 0.02, 0.04, 0.80, 0.04, 0.01 and 0.54, respectively while the reference *C. acutifolia* leaf gave 1.16% (Elujoba *et al*, 1989). There is sense and economy in using the Nigeria *cassia* as sustitute for imported laxatives in our hospital.

(e) Toxicity Studies On Medicinal Plants

Safety is always emphasised as the most crucial requirement that should be satisfied and should actually over-ride any other consideration, although documented experience on long-term and traditional usage without demonstrated harm is prescribed to serve as the basis of the risk assessment (W.H.O., 1993). There is

widespread belief that remedies of natural origin are harmless and carry no risk to the consumer. Nothing could be further from the truth, for many of those remedies including those of plant origin, contain potent pharmacologically active agent (Akerele, 1986). Even greater danger may be found in the use of highly toxic plants, erroneously identified as medicinal herbs. In certain cases, toxicity could be a reflection of wrong dosing, over dosage or lack of it which represents a major criticism of traditional medicine. A few practical examples will be useful and the fact that the seed of *Lagenaria breviflora* caused death of 40% of the rats used, despite its biological efficacy (Elujoba *et al*, 1985), showed that blind assumption of safety could be very risky and that care must be taken in preparing and using the extracts of the fruit in the human. We also examined the effects of repeated oral administration of *Cassia podocarpa* leaf infusion on the liver, kidney, and testes of male Wistar rats, using *Cassia acutifolia* leaf (Herb tea) as reference standard (Adefemi, Elujoba and Odesanmi, 1988). The infusion from the leaves of the two plants possessed very low acute oral toxicity with no lethal effects at 5.3g/kg; no incidence of mortality throughout the study with any of the tested doses and there were no treatment - related gross pathological changes in the organs examined.

The toxicity study further gave *C. podocarpa* as less toxic than the reference senna leaf since at low doses, *C. podocarpa* was less injurious to the testes. On the other hand and at all tested doses of the reference senna, and only at high doses of *C. podocarpa* testicular functions could be impaired. However, with both species and at all doses, chronic inflammatory cells and tissue necrosis in the liver was similar to the carbon-tetrachloride induced hepatic damage and the kidney tubular functions both proximally and distally could be impaired.

Ladies and Gentlemen, I wish to allay whatever fears this may be generating in this audience especially as the drug, Herb tea has become a household commodity for constipation. All the doses tested in this study were over 10 times higher than the normal therapeutic dose in rat and up to 100 times higher than the normal therapeutic dose in Man. The toxicity potentials of the fruits of *C. podocarpa* and *C. fistula* with reference to Senokot (Senna fruit) were similarly investigated and were found to support the earlier results on the leaves (Adefemi et al, 1988 and Elujoba, Akanmu and Iwalewa, 1999) giving the same levels of safety and overdose eventualities.

Datura metel Linn (Solanaceae), used as termite killer and antiasthmatic in traditional medicine, is an official substitute for D. *stramonium* in the British Pharmaceutical Codex (B.P.C., 1973) and has appeared in the African Pharmacopoeia (AP, 1985) as an antispasmodic drug in gastric, renal and uterine spasms.

The toxicity profile of the leaf of *D. metel* on albino rats, using *D. stramonium* of commerce as reference, has been reported by us (Elujoba with Alebiowu and Femi-Oyewo, 1998). Tissues from liver, kidney and intestine were sectioned and treated for assessment of tissue morphology. Generally, *D. metel* administered mice showed less anatomical abnormalities in all the tissues studied than *D. stramonium* administered mice. There is sense and economy in using the Nigerian *Datura* as substitute for imported buscopan in our hospital.

(f) Pharmacognostical Standardization of Herbal Medicines

Standardization of herbal medicine is the process involving a series of laboratory experiments that reveal and assemble a set of inherently peculiar characteristics. Such characteristics include

constant parameters, definitive, qualitative and quantitative values or specific, unique and unshared features on the basis of which similar herbal medicines, claimed to be the same, can be compared for the purpose of authenticity, genuiness, purity, efficacy, safety, repeatability, reproducibility and the overall quality assurance (Elujoba, 1995). The resulting specific standards obtained through experimentation can then be compiled to form a monograph of such a herbal medicine. Monographs of several herbal medicines can be assembled together to constitute a Herbal Pharmacopoeia, which carry an assurance of data for monitoring safety, efficacy and reproducibility which in turn become the essential parameters in any national drug regulatory requirements for a dossier. Simply described therefore, pharmacognostical standardization of a herbal medicine is the provision of a standard official monograph to include the essential characteristics of the plant components. This is done for the purpose of correct identification and quantification such that any other samples of the same plant, collected elsewhere and at any other time can be comparable and related to the original sample when subjected to the recommended monograph. Such other samples can either be accepted (if found to comply with the monograph) or rejected (if grossly below the standard). It is certainly easier to standardize a mono-component than a multi-component herbal medicine. Failed or rejected samples are classified as unofficial, sub-standard, counterfeit or fake drugs. In any official Pharmacopoeia all over the world, over 50% and for African Pharmacopoeia (A.P., 1985), more than 80% of the monographic data consist of pharmacognostical standards. Besides the efficacy and safety, the provision of pharmcognostical standards is a pre-requisite for herbal formulation and clinical exploitation (Elujoba, 1998) in order to improve general acceptability and trust as well as to allay the fears and scepticism of consumers, with less dangers of toxicity and side-effects.

WHO (1985) has suggested the following standards as necessary for any herbal medicine: an acceptable binomial name, local name, definition, chemical and biological standards, uses and major indications, its posology, contraindications in pregnancy, labelling, warning, cautions and storage conditions. Other possible requirements for drug registration, include consumer product information, mode of administration, duration of use, expiry date, lot number etc. (Elujoba, 1996). Sofowora (1993) gave fewer specifications but recognized that all stages of manufacture from collection to the final products must be standardized. It is only when the plant material has been collected at the right time, extracted by specified method and hence contains minimum quantity of active substance that a specified dose of the finished product can be expected to produce constant, reproducible medicinal effects in most patients at all times.

Certainly, not all the standards that are ideally required may be available for herbal medicines if we must make progress (W.H.O., 1991) and drug regulatory authorities in each country must determine the minimum requirements appropriately for each drug. However, the regulatory obligations must be practical, lenient and flexible without necessarily compromising the basic principles. In essence, some very common O.T.C. herbal preparations that are conventionally safe, may be waived from these requirement. For example in Germany (Keller, 1990), although herbal medicines are generally subjected to similar control measures as modern drugs, medicines which do not represent a direct or indirect risk to human health, can be exempted from rigid specifications. The Pharmacopoeia has recommended three main pharmacognostical standards for crude drugs, namely: structural, analytical and physical constants and the practical techniques would involve macroscopy, microscopy, ash and solvent extractive values, quantitative assay of chemical constituents, collection guidelines

and post-harvest treatments.

Pharmacognostical Standards For Nigeria Medicinal Plants

Towards the period of mid-eighties, the Organization of African Unity's Scientific, Technical and Research Commission embarked on research into standardization of selected commonly-used, proven, non-toxic and safe medicinal plants by encouraging various African plant scientists to come up with data to be included in the first edition of the African Pharmacopoeia (AP). Thus the A.P. (1985) has provided adequate pharmacognostic standards which can be used for identification and quality assurance for some 105 common herbs. The volume 2 contained recommended quality control procedures, simple and affordable enough considering the dearth of equipment and other facilities in Africa. Each monograph in the African Pharmacopoeia gives specifications for binomial name, synonyms, common names, selected African names, brief description, geographical distribution, morphological part used, macroscopy and microscopy for the whole and powdered herbs, chemical constituents; their purity, identity, and assay procedures, uses and storage.

Examples of such standardized herbs most of which have appeared in the African Pharmacopoeia as the contribution of the Pharmacognosy Department O.A.U., Ile-Ife research group through postgraduate Theses include: *Zanthoxylum zanthoxyloides* (Lam) Waterm. (Rutaceae) for its antisickling properties (Adeoye, 1978 and Adesanya, 1980); *Azadirachta indica* A. Juss (Meliaceae) for its antimalarial/antipyretic activities (Ekejiuba, 1984); *Ocimum gratissimum* Linn, (Lamiaceae) and *Euphorbia hirta* Linn. (Euphorbiaceae) for volatile oil contents and antimicrobial properties, respectively (Ekejiuba, 1984). *Datura metel* Linn. (Solanaceae) and *Cymbopogon citratus* (DC) Stapf. (Poaceae) for

antispasmodic and volatile oil content, respectively (Odukoya, Elujoba and Sofowora, 1987 and 1988); *Borreria verticullata* (L) G.F.W. Mey (Rubiaceae) for its skin remedies and *Chenopodium ambroisiodes* Linn. (Chenopodiaceae) for anthelmintic properties (Okelola, 1986, and Elujoba and Sofowora, 1992). *Voacanga africana* Stapf. ex Eliot (Apocyanaceae) and *Catharanthus roseus* (L.) G. Don. (Apocyanaceae) for its anti-tumor activities (Soleye, 1985). *Cassia alata* and *Cassia podocarpa* Guill. et Perr. (Leguminoceae) for their laxative properties (Elujoba *et al*, 1993, 1994, 1988 and 1989). All of these plants, following appropriate toxicological clearance, should be utilized as drugs in our hospitals.

Standardization Of Traditional Medical Practice

The general practice concept of traditional medicine lacks standardization ethics. From collection of plant species to the finished products therefrom, there is often no regard for standardization and no evidence of adequate control measures to ensure repeatability at any time. Selection is often a big problem since one single plant species can have several local or ethnic names, or several plant species bearing the same local name. Knowledge of diurnal, geographical, seasonal and chemical variations that can affect efficacy and quality of medicines, is non-existent in traditional medicine. Some other standardization errors may include unstandardized drying, extraction and storage procedures which could also result in serious reproducibility and risk eventualities, such that herbal preparations may vary in efficacy, purity, quality, potency and toxicity from batch to batch (Elujoba, 1995).

Partly due to the fact that traditional medical training is not uniform and partly because there is considerable room for unguided personal opinions especially where the spiritual and occultic aspects

are involved, the concepts of aetiology, diagnosis and therapy are virtually unstandardized. Besides the physical signs in certain disease states e.g. malaria, jaundice, diabetes etc., the aetiological and diagnostic concepts which mostly stem on spiritual or esoteric premises are difficult to standardize (Elujoba, 1999). Examples can be cited of the acclaimed influences of ancestors on the etiology of chronic illnesses such as psychiatric cases, also the absolute reliance on oracular consultations for diagnosis by some practitioners and then the use of ritual sacrifices as non-medication therapeutic modalities. There is need for us to address this important issue at federal, state and local government levels as a prelude to establishing a school of traditional medicine where all the various areas of standardization and conservation of plant and practice resources can be infused. A national drug formulary expert committee must be set up by the National Agency for Food and Drug Administration and Control (NAFDAC) to prescribe standards, develop monographs and recommend basic minimum requirements for registration of commonly used single and multi-component herbal medicines for our community. A comprehensive list of such medicines should be accompanied by standardized methodologies for quality control, treatment schedules and regulatory procedures (Elujoba, 1995). A national medicinal plant garden and herbarium facilities should be established to ensure proper authentification of plant species and to monitor standards.

(g) Dosage Formulation In Herbal Medicine Practice

Most dosage forms in traditional medicine are meant to be single dosages, extemporaneous preparations or relatively self-preserved remedies. Over 60% of traditional potions are in aqueous medium and mostly as decoctions involving heat, concoctions prepared without heat application and cold infusions implying plant juices. When multi-component herbal remedies are involved,

traditional-healers make their preparations without dosage formulation mentality. Each component part, even when it is not part of the active substances, is believed to contribute to the therapeutic effectiveness of the preparation. The whole mentality of drug additives or formulation excipients is obviously lacking in traditional medical practice. However, in our efforts to rationalize their practice, it has been noted that in any multi-component herbal mixture, the individual components have distinct functions such as colouring, preservative, sweetening and stabilization.

As regards preservation, and in order to prevent spoilage of dosage forms, it has been found that a good number of their preparations may be self-preserving: e.g. oily herbal drugs, alcholic medications, incinerated or burnt herbal preparation and completely dried powdered drugs (Elujoba, 1999). Although the W.H.O. has allowed the use of chemical preservatives to ensure stability of herbal medicines, many Nigerian traditional healers seem to disagree with the use of chemicals. In responding to this challenge, we have found clove extract and garlic juice to qualify as a pair of natural preservatives except for the high concentrations required (for Clove) or the foul odour and unpleasant taste for garlic (Elujoba and Adediran, 1997). A mixture of clove and garlic, used as preservative, may significantly mask some of the unpleasant odour and taste, inherent in garlic.

The powdered *D. metel* using *D. stramonium* as reference was formulated into tablets by direct compression, looking at the effects of powder particle size, binder variables and the storage time (Femi-Oyewo, Elujoba and Alebiowu, 1993 and 1994). 25% *Datura metel* dried powder was granulated with lactose-based agent using any of cassava, gelatin or Polyvinyl pyrrolidone (PVP) as satisfactory binder at between 2 to 5% concentration. The resulting *D. metel* tablets were administered to 22 Nigerian women with

history of primary dysmenorrhoea in a double-blind randomized cross-over comparative trial using Buscopan tablets containing 10mg of hyoscine - N - butyl - bromide as reference drug, in order to confirm the efficacy of *D. metel* (Femi-Oyewo *et al*, 1993). *D. metel* tablets thus exerted a comparative significant effect on all symptom indices used in the assessment of menstrual pain. The drug was well tolerated by the patients of dysmennorrhea and devoid of any deleterious side-effects.

In another example, tablets were prepared from dried leaf of *Cassia podocarpa* (whose laxative potency was previously validated) containing 500mg powder per tablet equivalent to 10mg total sennoside (Elujoba *et al*, 1994). The resulting tablets compared favourably with the imported senokot tablets, a commonly prescribed laxative drug in the Nigerian primary health care delivery system. Obviously, solid formulation such as tabletting is a specialised technique requiring expertise, heavy financial and equipment commitments which are not readily affordable in the African setting. Dosage forms such as tea bags and stabilized liquid preparations will be much more affordable. A stable emulsion of the volatile oil from *Ocimum gratissimum* leaf, locally used to stop diarrhoea has been formulated by us as an anti-diarrhoea preparation (Elujoba, Orafidiya and Iwalewa, 1999). The leaf of the plant and its volatile oil content have previously been standardized (Ekejiuba, 1984). The juice from the leaf, which is commonly used to stop nose-bleeding, was found not to possess any coagulant activity but rather an anti-coagulant activity. Thus, Elujoba, Durosinmi and others (1998) have recently prepared an anticoagulant agent, comparable to EDTA for routine haematological screening such as blood film PCV, total blood count, WBC with Differentials as well as haemoglobin electrophoresis. There is sense and economy in using the emulsion and the anticoagulant from this plant in our hospitals.

(h) The Inexplicable Practices In Traditional Medicine

The inexplicable form of traditional medicine refers to those traditional practices of medical nature that cannot be explained by any scientific theory and can usually be grouped under "Occultism". These would include extrasensory perception (ESP), psychic experiences, mysticism, supernatural indications, astronomy, palmistry, esoteric features, oracular consultation, witchcraft and so on. This is the most feared, controversial and dreaded aspect of traditional medicine since it involves mystical powers whose explanations are far beyond ordinary human intelligence and they are more superior to any intellectual comprehension, resolution and rationalization. Although, therapeutic occultism may exist which could be used for therapeutic healing, protection of health and self-defence, the art is more often intended for evil machination? It is the easiest explanation by our people for chronic illnesses, ill-luck, motor accidents, miscarriages, and unexplained sudden deaths. The closest slang for occultism in our environment is "juju".

(i) *General Practice in Traditional Medicine*

Aetiology in traditional medicine is believed to relate not only to physical and psychosocial causes (Lambo, 1973), but also to astral influences (due to the influence of the moon and stars), also to purely spiritual causes (due to the evil thoughts and machination by enemies), esoteric causes (i.e. originating from the soul or caused by the deeds and actions of an individual prior to re-incarnation). The hausa practitioners in Nigeria believe not only in naturalistic basis of disease causation, related to the cold and heat energies as in jaundice and asthma, but also in personalistic basis involving the existence of the spirit world through human agents such as witches. Another

aetiological category by the hausa belief is the ***Will Of Allah*** which pervades above all and may affect anything positively or negatively. However, medication in this regard, is not limited to prayers alone (which defy laboratory experimentation) but also physical contact with plant substances (Etkin, 1988). Since traditional healers in Africa place so much value on supernatural and occultic practices, they are often consulted not only for sickness or disability but also for good luck, promotion, love or whenever misfortune strikes in the family. The Yoruba traditional healers have always seen man as a psychosomatic being who has a spiritual relationship with his physical environment as well as association with the universal spirits controlling his Cosmos (Ilesanmi 1995).

In Swaziland, it is cultural belief that diseases can result when the body gets out of balance with itself or when a person is not in harmony with his or her family, academic colleagues, friends, society, ancestors or environment (Akerele, 1986). The Chinese traditional doctors believe that the escape and loss of energies from a particular organ or tissue in the body leads to the disease of that body organ or tissue. Hence, acupuncture needles are inserted at the point of energy loss or escape (Akerele, 1986). Positive health, according to the Ayurveda practitioners of India, is the blending of physical, mental, social and spiritual welfare because life is the union of the senses, the mind and the soul (Razzack, 1978).

Besides physical examinations, using different sensory characteristics in disease diagnosis e.g. visual examinations of the eyeballs and skin in jaundice or hepatitis, most other traditional techniques of diagnosis are inexplicable. For example, the use of mind-revealing herbal preparations (Sofowora, 1993) to provoke the patient to tell his own disease; or the analysis of dream technique, the use of spiritual trance by faith healers in which candle burning is used to stimulate spiritual clairvoyance as well as the use of divination such as

"Ifa" oracular consultation, cannot be explained scientifically. In some treatment modalities where unexplained methods are also used, the traditional healers may utilize ritual sacrifices, incantations and charms to prevent or eliminate diseases such as psychiatric cases. This is probably why the Yoruba people in this country appear to prefer traditional to modern orthodox practice in the management of mental disorder (Makanjuola and Jaiyeola, 1987). Similarly, faith healing, where holy water, holy oil, prayer and fasting are prescribed cannot be investigated scientifically (Elujoba, 1991). In traditional preventive medicine, incisions are often made on strategic points on the human body e.g. the wrists, ankles, face, head, waist or at various body joints, either for the treatment of certain disease states or in order to prevent or remove any occultic attack inflicted by the enemies. In some other cases, a medicated soup could be administered for the same purpose as a form of vaccination (or "ajesara" in Yoruba) to ward off occultic attacks.

(ii) *Incantations In Phytotherapy*

Incantations are a form of play on words written down or delivered orally by traditional healers in poetic verses to conjure up forces or powers onto herbal medicines. The words which are composed in most incantations, are so strong, powerful and invoking as to bring out the seriousness, suggesting the presence of some supernatural and invisible performing elements between the traditional healer and the ultimate effects. Therefore, effective incantations must be capable of causing the intervention of those spiritual elements who carry out the desired effects on behalf of the practitioner (Elujoba, 1988). For effectiveness, incantations can either be combined with herbal preparation or used alone. Hence, not all medicines require incantations and not all incantations require herbal medicines for efficacy. Are incantations really therapeutically effective? Or are they mere display of literatures to scare away or discourage the clients from

practicing the medication on their own? Could it be said that since most traditional healers are illiterates, memorizing and regularly reciting the incantations could help them to remember the correct herbal components and the mode of preparation of the medicine since these are often contained in the appropriate incantations? Do incantations merely serve as a psychological evidence of a big deal in the presence of the client?

Obviously, incantation therapy belongs to the inexplicable traditional medicine and it would be difficult to scientifically investigate its efficacy. However, incantations are generally believed to involve invocation of some spirits to initiate, influence and sustain an action especially of medical and occultic nature. Whose spirits are we invoking with incantations? Or whose spirits are we requesting to do the action? Are we invoking the spirit of God or the spirit of the devil? If God's spirit is being invoked and for harmful incantations, are we religiously justified to ask God to do harm? If the spirit of the devil is being invoked and with therapeutic or curative incantations, are we morally justified to believe that the devil can do good? My research has not yet answered these questions, ladies and gentlemen.

(iii) *Traditional Medicine and the Bioactive Agents*

In Science, the existence of active chemical constituents or bioactive agents in a particular medicinal plant is the only explanation for the pharmacological response. It is fundamental science that the therapeutic effects observed in herbal medicines are attributable to some known or unknown bioactive chemical substances present in those herbs. It is also true that different herbs do possess different types of bioactive chemical agents either qualitatively and/or quantitatively. Hence, different medicinal plant species would cure different diseases and no single herbal medicine can be said to cure all ailments simply because a single plant species cannot contain all the bioactive chemical

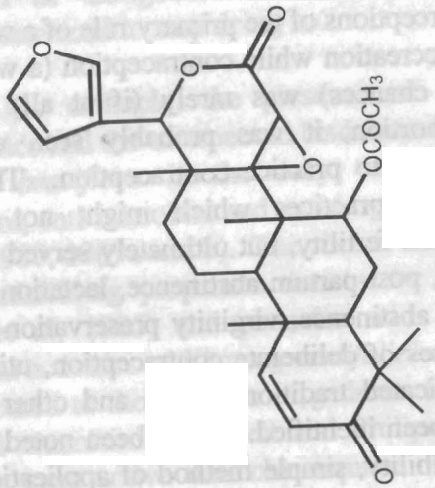
constituents. It then follows that any traditional healer that promotes the "cure-all" or "Gbogbonise" herbal preparations must be wrong and should be convinced to stop doing so.

For example, the presence of the inorganic salts, the phenolic acids and the triterpenoid bisdesmoside saponins in the fruit of *Lagenaria breviflora* is the only explanation for the observed abortifacient, anti-microbial and anti-implantation activities (Elujoba *et al*, 1985, 1987, 1989a and b). The root of *Zanthoxylum Zanthoxyloides* possess antisickling properties due to the presence of Xanthoxylol (Elujoba *et al*, 1985) and phenolic acids (Sofowora, 1975). The antimalarial activities of *Khaya grandifoliola* and *Artemisia annua* have been attributed to the contents of gedunin (Agbedahunsi and Elujoba, 1998) and artemisinine (O'Neil and Philipson, 1989) which is about fifty times more active than chloroquine. The anthraquinones of the Nigeria *Cassia* species are responsible for the laxative activities (Elujoba *et al*, 1989). The alkaloids of *Murraya Koenigii* have also been implicated in the various medicinal uses of the plant (Adebajo *et al* 1997).

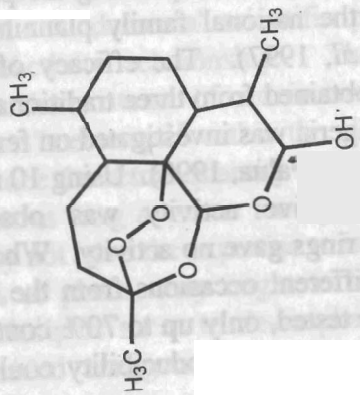
What do the traditional healers believe in this regard? Obviously, there is no evidence that the practitioners of traditional medicine believe in the fundamental scientific principle of chemical constituent-linked bioactivity relationship. Their own philosophy appears to be based on the existence of certain energy or vital life-force or an unseen "spirit" or "messenger" within the plant which confers the therapeutic effects; hence the actual quantity of the herbal component is often not as important as long as some amount is present. Although traditional healers may not have the expertise to isolate and characterize chemical constituents of plants, they ought to be made to believe in these fundamental principles so as to de-emphasise the un-necessary unfounded and unguided exaggeration on the inexplicable spiritual involvement.

(iv) *Traditional Contraceptive Rings*

Dominant perceptions of the primary role of a woman in the traditional Nigeria, is procreation while contraception (a willful means of reducing pregnancy chances) was rarely (if at all) consciously contemplated. Like abortion, it was probably seen as immoral, sacrilegious and punishable to practice contraception. There existed however, several cultural practices which might not have been originally meant to regulate fertility, but ultimately served the purpose e.g. voluntary abstinence, post-partum abstinence, lactation abstinence, grand-mother mandatory abstinence, virginity preservation and female circumcision. A few cases of deliberate contraception, utilizing plant remedies, incisions, medicated traditional rings and other devices as well as witchcraft, have been identified. It has been noted that due to the low cost, easy accessibility, simple method of application, secured privacy, easy reversibility and apparent lack of toxic side-effects, traditional contraceptive devices have become more popular. Jinadu in 1998, reported that only 5.5% of those users of traditional contraceptives (e.g. ring, soup, incision or belt) got pregnant compared to 34.5% of the non-users that got pregnant. This demonstrated the apparent effectiveness of the traditional contraceptive devices showing that there might be value in incorporating the promotion of traditional contraceptives into the national family planning programmes in this country (Jinadu, *et al*, 1997). The efficacy of medicated traditional contraceptive rings obtained from three traditional birth attendants from the south-western Nigeria was investigated on female, virgin albino rats (Elujoba and Ogunyemi-Falua, 1998). Using 10 rats per set of 10 rings, up to 90% contraceptive activity was observed while the 10 unmedicated control rings gave no activity. When the second batch of rings, obtained on different occasions from the same three traditional birth attendants were tested, only up to 70% contraceptive activity was obtained. The low level of reproducibility could be attributed to the



GEDUNIN from *Khaya grandiflora*



ARTEMISININE from *Artemisia annu*

possible lack of standardization and process control in the preparation of the traditional contraceptive rings. This is an example of inexplicable form of traditional practice and it does prove that given the appropriate experimental model, some aspects of the inexplicable form of traditional therapy can, in fact, be rationalized. And although at present, there are limitations and difficulties in the scientific study of such practices, they should not be ignored outright but methods should be evolved for their evaluation even if it involves re-thinking of the western materialistic methods and the development of new theories.

THE CHALLENGES OF HIV/AIDS AMONG US

The beauty of an academic career is the urge coupled with the ability to face any type of problem in the Society be it academic or social and irrespective of the specific discipline and training background. The global menace and the incurability of AIDS caused by the presence of the Human Immunodeficiency Virus (HIV) in the blood and in some other body fluids mainly through sexual relationships, calls for serious concerns not only among health personnel but also among all well-meaning Nigerians particularly the intellectuals. Since 1981 when the first case of HIV/AIDS was reported in the U.S.A. followed by its presence in the East African countries, the global incidence has risen to over 30 million people carrying the AIDS virus in the world by 1997. New infection per day is about 16,000 people. In Nigeria, over 3 million people were living with the virus in 1996.

Mr. Vice-Chancellor Sir, partly due to my background in Pharmacy, my interest in traditional medicine and my concern for the immediate environment, I decided to join the African Aids Research Network (AARN) . This is a multi-disciplinary and non-governmental organization based in the Department of Dermatology and Venereology of our College of Health Sciences (under the able

leadership of Professor Adewale Akinsola), providing services, education and carrying out research in the field of HIV/AIDS. The Network has since been involved in presenting an annual awareness lecture to all "Fresh" students of this University during the Orientation Week. We tell them about the disease, how it is spread and how it can be avoided. The present level and type of social interaction going on within our academic communities namely: student-student, student-staff, staff-staff and also town-gown relationships, calls for redress and caution if we must survive the HIV scourge. It is our recommendation that this University should adopt a compulsory special elective (like the S.E.R. series) and the idea ought to be sold to other higher institutions in Nigeria, so that every undergraduate or postgraduate student is aware of the disease, its consequences and how he or she can avoid it.

HIV Transmission And Culture

The vital age groups and the cream of our society are being lost to HIV/AIDS: babies to HIV-positive parents, the youth, adolescents childbearers, able-bodied manpower, the middle-aged leaders of today and tomorrow, carers of the aged, people belonging to the age of satisfaction and accomplishment are all among the people that Nigeria loses everyday.

The Network may need to design a strategy to mount a campaign against the cultural activities which tend to promote the vulnerability of Nigerians to HIV/AIDS transmission e.g.: community tolerance of multiple sexual partners for men as well as polygamy, wife-sharing or wife-inheritance among brothers, wife-sharing with husbands's father or male member of a clan, inheritance of father's younger wife, sex with traditional or faith healers, and the twin ceremony which includes sexual ritual ceremony between family members in some parts of this country.

HIV and Traditional Medicine

Over 80% of the inhabitants of Nigeria live in the rural areas where traditional medicine is the main source of health-care. HIV/AIDS is incurable by Western drugs while traditional medicine continues to be used openly or blindly by people living with HIV/AIDS under alternative therapies all over the world. Indeed, there are various claims of proficiency by traditional healers across Africa (e.g. Cameroon and East Africa). With the hope that a magic drug for management or total cure can come from the jungles of Africa, we conducted a survey under the umbrella of the Network on the knowledge, attitude and practice of traditional healers in the management of HIV/AIDS using Ife Central and Ife East Local Government areas of Osun State as a model (Elujoba, Fadairo and Irinoye 1999). 51 traditional healers were issued with self-administered, simple and self-explanatory questionnaires using a convenient sampling technique. They all claimed adequate knowledge of STD and HIV/AIDS with about 80% of them claiming to have learnt about the diseases from their ancestors although only 29% have ever treated HIV/AIDS. About 70% believed that they treated more male patients than female while 41% revealed that HIV patients often appealed for confidentiality from their sexual partners, and claiming considerable management success.

Ladies and Gentlemen, the HIV/AIDS patients would certainly prefer the traditional healers, probably in pursuit of the most-needed possible cure, easy accessibility, assured affordability and comfortable privacy. Therefore sustained collaboration with the traditional healers can lead to drug discovery and provide additional avenues in the community for HIV control strategies. I like to use this medium to persuade the African Aids Research

Network to re-order its priorities in view of the prohibitive costs of conventional anti-retroviral drugs and make policies to research into the low-cost traditional remedies for specific opportunistic infections in the management of HIV/AIDS. Hence, our experience on the use of "Bitakolin Syrup" a formulated product of bitter kola (*Garcinia kola)* for respiratory disturbances and the infusion of Efirin (*Ocimum gratissimum*) leaf for diarrhoea in HIV/AIDS patients is worth investigating. The various skin remedies and medicinal plants e.g. Aloe Vera, implicated in traditional skin therapy could give an answer to the menace of Shingles as well as Kaposi Sarcoma, skin cancer in HIV/AIDS. Strengthened interactions with knowledgeable traditional healers therefore could lead to several other discoveries of useful remedies for specific opportunistic diseases in HIV/AIDS. It is my vision that such approach could reduce the mortality of HIV/AIDS close to that of a typical chronic disease like diabetes or hypertension.

THE GLOBAL SCENE FOR TRADITIONAL MEDICINE

India has since been utilizing Ayurveda, Unani and Siddha as their traditional systems of medicine with a network of over 600 traditional hospitals; 15,000 traditional dispensaries and about 250 traditional medical institutions. China has also attached great importance to traditional medicine with over 28 traditional Chinese Medicine Colleges, 38 University Faculties of Traditional Medicine and 54 research institutes of traditional medicine with over 1200 traditional hospitals of 87,000 beds as well as 320,000 traditional healers. These doctors are known as the barefoot doctors who are devoted entirely to traditional medicine scheme (WHO, 1985a). Other countries include Sierra Leone which had fully integrated traditional birth attendants into their primary health care scheme; in Lesotho, traditional healers have been officially recognized since early 1970's while some traditional healers, selected by their

immediate communities, have been trained as village health workers (W.H.O. 1985b). In Thailand, there are contemporary health centres that have systematically incorporated traditional herbal preparations into primary health care activities that represent the easy ways in which this concept can be translated into practice. Thailand traditional doctors are regulated and are trained in an official school with an official syllabus and licensing examinations. Swaziland has practically exemplified specific procedures of approaching incorporation of traditional medical practice through the re-training of traditional healers (WHO, 1986b). In Zimbabwe, the Ministry of Health maintains a close liaison with the Zimbabwean Traditional Healers Association; Malawi has recognised the roles of traditional practitioners in the lives of all the social classes and in fact the practitioners outnumber all the others. There are over 11 recognised traditional medical colleges (for Ayurveda. Unani and Homeopathy) with modern equipment in Pakistan (WHO, 1987) while in Korea, traditional medicine is taught as an obligatory subject in all medical schools and is available as a form of treatment in all Korean hospitals. In Ghana, traditional practitioners form the backbone of health care system with 30,000 registered membership that caters for about 75% of Ghanaians especially in the rural areas, although the healers are not officially recognized nor regulated. Kampoh, the traditional medicine of Japan has been brought officially into the national health insurance plan (WHO, 1988). The Kenyan government has established a Traditional Medicine and Drug Research Centre in Nairobi with various positive terms of reference (WHO, 1990).

In Nigeria, traditional healers serve the rural and the urban dwellers both in healthy and in disease states. Their roles in selected areas are very important to the rural communities and almost virtually indispensable. The various Federal Government efforts since 1966 to date, have since crystallized into an official

approval for the recognition of traditional medicine in Nigeria. Several State Governments have established Boards of Traditional Medicine and the Decree establishing the National Council for Traditional Medicine which will liaise with the State Boards of Traditional Medicine to effectively regulate and control the practice in the country, is in progress.

4. CONCLUSION

The Vice-Chancellor Sir since submitting a list of recommendations at Inaugural Lectures has become routine and may sometimes be threatening, and at times may appear unserious, I have designed this inaugural lecture to incorporate and build-in the recommendations *in situ*. However, succinctly put: the lecture has treated Pharmacognosy as a relevant subject in Pharmacy and indeed the father of all,which has set out to move closer to our medical culture as represented by the traditional medical practitioners in order to bring out the essence of our existence as Africans. Although all that glitters is no gold, a good number of the herbal medicine practices already tested had been found to possess sound scientific justifications which can be exploited in Primary Health Care. The practitioners themselves, following appropriate re-training programmes in order to remove the harmful, undesirable aspects of their practices, can equally serve as additional medical manpower in primary health care. It is envisaged that the existing State Traditional Medicine Boards, which will be guided by the proposed National Council for Traditional Medicine being constituted by the Federal Government will rise up to their responsibilities and would be able to enforce the various legislations on traditional medicine practice when formulated. Creating awareness on the principles of traditional medicine among the Nigerian health personnel including the medical and nursing students who should be exposed to some aspects of traditional

therapy, is long overdue if we must make progress. This would encourage and facilitate dialogue, communication, mutual trust, understanding and eventual integration of the practitioners with the orthodox health system in our country. This experiment can succeed in Ife with the present crop of knowledgeable and amiable medical team in our College of Health Sciences. Like in all other good things we should pioneer this cause.

And finally to all of us here present, you will agree with me that we should not reject our traditional medicine outright for fear of losing potentially useful ones, nor should we accept it blindly in view of the toxic remedies and harmful practices. We should examine it critically with an open mind. If we do this, then we are objective and educated but if not, then we are biased and ignorant. Traditional medicine is our main socio-cultural heritage for health, and it will be very unfair to use our education to destroy it, rather we ought to regard our education as a process of learning how best to utilize and develop our culture.

Our civilization should not be used to discredit our traditional medical values but rather, our knowledge of science ought to be used to understand better and to further develop and modernise our indigenous medical practice for the benefit of mankind.

The current use of solely orthodox approach to primary health care in pursuing health for all, unless it is available at the door-step of the majority of the jungle-dwellers as well as the nomads of this country, the issue of health for all will remain a dream. The Alma Ata Declaration (WHO, 1978) gave 22 years to member states to mobilize all available resources (including traditional medicine) to attain health for all by the year 2000. This is 1999 (only about 8 months or exactly 234 days before the year

2000): no matter what we do now, it is too late to achieve this health status by the year 2000. If we actively start this year by mobilizing, re-training and incorporating our traditional medicine and the traditional medical practitioners for primary health care activities and with all the other health - promoting facilities (eg. potable water, increased food production, sanitation, etc.) put in place, we might achieve health for all by the year 2010.

ACKNOWLEDGEMENT

On behalf of my family, I wish to express a profound gratitude to the authority of the Obafemi Awolowo University for appropriate support at the appropriate time, especially, for providing me with the enabling environment for the required academic and administrative developments. May the glory of God continue to shine on the GREAT IFE and all those that made it great.

Mr. Vice-Chancellor Sir, the special guests from within and outside this University, friends, colleagues, well-wishers, ladies and gentlemen, I thank you for your attention and God bless.

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