UNIVERSITY OF PORT HARCOURT

ROLLING BACK MALARIA IN NIGERIA: THE LAW OF THE FEW

An Inaugural Lecture

By

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INAUGURAL LECTURE SERIES

NO 75

26 MAY 2011

University of Port Harcourt Press

University of Port Harcourt

Port Harcourt, Nigeria

Email: tayo_ebong@yahoo.com

ISSN1119_

INAUGURAL LECTURE SERIES No. 75

DELIVERED: 26 MAY, 2011

Designed, Printed and Bound by UPPL

THE HONOR ROLL

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Ladies and Gentlemen

ACKNOWLEDGEMENTS

God the giver of all things has made this day possible. I owe a lot to His guidance, unfailing love and compassion.

I thank God for my parents: mother, Mrs Helena Adekunle, and late father, Deacon Samuel Akinlabi Oloyede Adekunle who connived with my mother to start the process of my birth and education. I love you Seyi, Moroun and Sola, my siblings for your unfailing friendship and love.

My family is here. My husband has been my pillar, mentor, and guide. He is my friend indeed and I am blessed to have him. My six children: Eme, Uwem, Eno, Ubon. Udeme and Akanimo, five of whom are here and my two grandchildren, Abai and Imikan have given me so much joy. For all the children in my home who call me Mum: Lele, Mayowa, Udeme and others that I cannot mention here, I thank you all for your love and support. Special thanks go to the silent workers who give of their best always: Joshua Isirima, Matilda Deekor, Ovunda Woko, Emilia Udom and Iboroma Korubo-Owiye.

In my journey to this point, I have met some special people. I cannot mention all. To all my teachers and some special persons who have touched my work, I pay special respects. Some of these people include Prof. L. A. Salako, Prof D. T. Okpako, Prof Dupe Makinde and Dr. Funke Falade of the University of Ibadan. Prof. Abu Zar of the University of Newcastle Upon Tyne, England, Prof. P O Okonkwo of the University of Nigeria, Enugu Branch and Prof. O. A. Onabanjo of University of Lagos. To my colleagues and my

students, past and present, at the University of Port Harcourt, I thank you all today.

1.0 INTRODUCTION

Mr Vice-Chancellor, Sir, the thrust of my research and work in the academic field, for over 30 years now, has been in two main areas as follows: **1. Basic Pharmacology and 2. Health Research.**

2.0 BASIC PHARMACOLOGY

The word Pharmacology is described as coming from two Greek words: *pharmakon (φάρμακον)* meaning drug, and *logos*, λόγος, "knowledge" meaning a discourse. (The free encyclopedia, Wikipedia 2011). Pharmacology is the study of drugs. It provides knowledge on drug use and safety. As a basic science, pharmacology deals with actions of chemicals at the molecular, cellular, organ and whole-body levels.

Pharmacology is regarded as a hybrid science consisting of aspects of both basic science and therapeutics. It freely draws upon the resources of all the **basic medical sciences, in particular biochemistry, microbiology, physiology and pathology** and it contributes to every aspect of **clinical medicine.**

Drugs are chemical substances that have an effect on living organisms; medicines are drugs used to treat or prevent disease.

The pharmacologist is a biological researcher who seeks to understand pharmacological principles using ***in vivo*** and ***in vitro*** technology to determine actions, mechanisms of actions and toxic effects of drugs and chemicals. The pharmacologist may also have to investigate the possible harmful effects of chemical agents (drugs, pesticides, food additives, industrial chemicals), biological agents (plant and animal toxins) and physical agents (ionizing and electro-magnetic radiation) on living things.

2.1 Receptor Mechanisms

Pharmacologists engage in continuous discourse on drug effects and receptor responses. A receptor is any cellular macromolecule that a drug binds to initiate its effects. We applied the principles of scientific experimentation to describe drug actions on various isolated tissue preparations.

The controversies in the nature of the neurotransmission processes in the *vasa deferentia* lingered for a long while, in the 1980s. Electrical stimulation of the vas deferens releases two main neurotransmitters. First, a main neurotransmitter at the epididymal end, called Noradrenaline, which acts on the adrenergic receptors. Then, another unknown main neurotransmitter at the prostatic end which acts neither on the adrenergic nor on the cholinergic receptor so, it is non-adrenergic and non-cholinergic.

We studied the role of these neurotransmitters in the vas deferens of the rat. Our studies showed that the differences in the neurotransmission processes between the prostatic and epididymal ends of the rat's vas deferens were of functional significance. The two ends respond differently to

temperature and to continuous electrical stimulation. Cooling caused an inhibition in the noradrenaline release and enhanced the non-adrenergic neurotransmission. Also, during prolonged stimulation, the functioning of the vas deferens is maintained by the noradrenergic transmission at the epididymal end as the non-adrenergic transmitter at the prostatic end becomes depleted. This process helps to maintain the normal functioning of the excretory ducts of the testes. (**Ebong, 1986**; 1987; **Ebong** & Zar 1982; 1989.**)** Our studies on receptor mechanisms include effects of phentolamine and reserpine on adrenergic receptors in the rat vas deferens (**Ebong** & Zar, 1982); histamine receptors in the isolated chick intestine (**Ebong** & Okpako, 1977)); and the dopamine receptors in the isolated guinea-pig ileum, (Ebong & Zar 1980; Zar, **Ebong** & Bateman, 1982; **Ebong**, 1988).

3.0 HEALTH RESEARCH

I present here a summary of some of my work in health research which has been mostly focused on diseases that affect us in the tropical region and their treatment. My studies have been mainly on Onchocerciasis, Phytomedicine, Leprosy, HIV/AIDS and Malaria.

3.1 Onchocerciasis Drug Distribution

Onchocerciasis is an endemic disease which is a major cause of blindness and morbidity in Nigeria. Country-wide distribution of Ivermectin (Mectizan) started in 1991. Drug administration to infected individuals is carried out in single annual doses for ten years which represents the life span of

the adult worm. Because of this long period of drug administration there is need to develop an operational mechanism which will ensure cost effective, sustainable and successful Mectizan delivery so that the persons at risk can participate in the mass treatment in a way that could be sustained over a period of 10 years.

We took part in a community-based study. Our study was carried out in Ehime Mbano local government area of Imo State among 508 persons in 100 households. We investigated the coverage, compliance, sustainability and excluded individuals in the drug distribution. Our study developed a Rapid Method for Monitoring Mectizan Distribution and showed that local teachers, resident in the communities were better for monitoring Mectizan distribution than non-resident trained enumerators (Ebong & Wariso, 1994; Umeh. Mafe., Ebong, Dipeolu & EI-Hassan1994).

3.2 Phytomedicine

Historically, plants have been the source of inspiration for many novel drug compounds. Indeed, plant-derived medicines have made a significant contribution to human health and well-being. Quinine from the bark of the cinchona tree, *Cinchona officinalis* and the Eastern herb, *Artemisia annua* L (Wormwood) are examples. *Artemisia annua* is used in China to treat fevers and is now the source of the modern drug Qinghaosu, an antimalarial compound. The continued reliance of contemporary indigenous populations on plant medicines warrants scrutiny of many of the known

plant species for pharmacological action, adverse interactions and long-term toxicity.

Medicinal plants are well known to play a key role in world health with about 80% of Africans including Nigerians depending on phytomedicines (Idu, 2010). Many Nigerians believe in the powers of herbal medicines, and many combine these herbs with orthodox medicines. Anyone who has lived in the village will be able to name a plant that has been claimed to have a medicinal property. However, it will be difficult to get two people from different villages, if they agree on the use, to agree on the method of preparation and dosage regimen for the same medication. Therefore, the problem of assessing the efficacy of herbal medicines and standardizing preparations is major.

There are many ways in which herbs can be prepared to be used for medicinal purposes. These include decoctions that are made as teas which can be prepared from bark, seed, root, fruit or leaf of the plants. Even if we did not take the decoctions when we were young, we still go for herbal medicines in old age in the forms of supplement capsules or drinks, such as the "Forever Living," "Tanti," the "Pax", "Aloevera," "Ardyss" and the "Nature's Bounty" products, and also the Green teas. There are claims that some of these medicinal plant products have more beneficial effects than their synthetic counterparts through being safer, acceptable, affordable, culturally compatible, and suitable for chronic treatments (Okigbo & Mmeka, 2006).

It may interest you to know Mr. Vice-Chancellor, Sir that my interest in phytomedicine and malaria dates to my primary school days. Once, my mother gave me chloroquine

for malaria. I did not sleep all night because of my reaction to the drug. My aunt saw my suffering and brought me '***agbo***,' made of plant parts to drink. I swallowed it and felt better the following morning. I do not know whether it was the chloroquine or the '***agbo'*** that cured me. From that time, I became very conscious of the disease, malaria, and of the possibility of herbal therapy for it.

I have continued to show interest in medicinal plants research and in validating the traditional claims of their healing efficacies. This has involved investigations on the local use of the plant and ***in vivo*** activity-guided studies of crude extracts in animals.

3.3 Leprosy

Our first studies in phytomedicine started with plants in the treatment of leprosy. Leprosy is one of the most dreaded diseases and almost all branches of traditional medicine, including psychotherapy, therapeutic occultism and herbal medicine have been employed in its treatment. Thirty-four species of plants reportedly, used in the treatment of leprosy, were reviewed. The safety profile of one of such plants, *Lasiosiphon kraussianus* (Meisn), (called "Tururibi in Hausa) was evaluated in four animal species (mouse, rat, rabbit and dog). This plant is well used in Northern Nigeria. Our studies showed that even in high doses this plant could be taken as often as needed without any serious adverse effects (Nwude & **Ebong,** 1980; **Ebong** & Nwude, 1981).

3.4 Diarrhoea, Fungal and Other Infections

We investigated and confirmed the potential use of some plants: 1) *Xylopia aethiopicum* (Dunal) A Rich (African

pepper); as an antispasmolytic, which in the uterus may prevent abortion and in the intestines can be used in the treatment of diarrhea; 2) *Kalanchoe pinnata* (Lam) Pers in the treatment of fungal infection; 3) *Garcinia cola* (Guttiferrae); and 4) *Cola acuminata* (Sterculiaceae) which increase gastric acid secretion. The results of our studies have shown the potentials of some of these plants in the treatment of disease and provided increased understanding on the use, mechanisms of action and toxicity of these local plants of medicinal value (**Ebong,** Wariso, & Orupabo, 1995; **Ebong** & Shode, 1999; Wariso & **Ebong,** 1996).

3.5 HIV/AIDS

Combination antiretroviral therapy (ART) is the cornerstone of management of patients with HIV infection but requires a high level of adherence to achieve viral suppression. Psychosocial factors may affect adherence. Our study determined the rate of adherence of adult HIV seropositive Nigerians to antiretroviral therapy and the effects of psychosocial factors including psychiatric morbidity, patients' perception of their illness, availability of social support, and preference for alternative medicine on adherence to antiretroviral therapy. A cross sectional descriptive study was carried out with 192 patients recruited from among patients attending the HIV/AIDS clinics at the University of Port Harcourt Teaching Hospital (UPTH) and the Braithwaite Memorial Hospital (BMH), Port Harcourt, Nigeria

Our study showed that adherence rate to antiretroviral therapy (that is patients who took 95% or more of the prescribed antiretroviral drugs in the previous month) was 72.2%. Factors associated with poor antiretroviral therapy

adherence were depression and preference for alternative medical approach like herbal medications.

Our results showed that patients who had poor knowledge of HIV/AIDS and its treatment, poor social support and self-perception of health status had lower adherence rates. The level of adherence to antiretroviral medication among this cohort of patients is poor. Presence of depressive symptoms and preference for alternative non-orthodox therapy are associated with poor antiretroviral therapy adherence (Asekomeh, **Ebong,** & Onwuchekwa, 2010).

3.6 Malaria

Mr. Vice-Chancellor, malaria is at the forefront of my passion in health research and of my research effort today. Before I give an overview of my contribution on malaria research, permit me to discuss my interest in this work and summarize a few aspects of the worldwide, regional, and national effort to fight the disease.

Malaria is a disease that has been with us for as long as we know. It is a life-threatening and devastating parasitic disease transmitted by mosquitoes (Fig.1). Malaria is still the most destructive and dangerous parasitic infection in many tropical and subtropical countries. In Nigeria, 50% of hospital attendance is attributed to malaria. It is one of the world's most common and most serious tropical diseases, and probably one of the oldest diseases known to mankind, and that has had profound impact on our history. Malaria has been responsible for the decline of nations and crushing military defeats; often having caused more casualties than

the weapons themselves" (Eur. Alliance against Malaria, 2010). Malaria continues to be a huge social, economic and health problem, particularly in the tropical countries and the terrible effects associated with it are as ancient as the history of civilization, and therefore the history of mankind itself.

Malaria is, above all, a disease of the young and of the poor, many of whom live in remote areas with no easy access to health services. However, while access to interventions has increased, gaps remain, and many challenges continue to complicate malaria-control efforts in hard-hit areas. These challenges have been reported to include poverty, poor sanitation, inadequate health systems, limited disease surveillance capabilities, drug and insecticide resistance, natural disasters, armed conflict, migration, and climate change (WHO 2009; United Nations 2009 and Roll Back Malaria, 2008). How do we overcome these difficulties to achieve control and "roll back" malaria? The new strategy for "Roll Back Malaria" will be successful when individuals, families, communities, local leaders, staff and students, shopkeepers and schoolteachers, businessmen and women all become fully committed and involved in the effort to roll back the disease. We need to support the effort now being made by the government, and other agencies in the national malaria control scale-up programmes and maximize the resources available.

"Of all the ills that affect mankind few have taken a higher toll than malaria" (Foottit & Adler 2009).

OVERVIEW: (KNOW YOUR ENEMY)

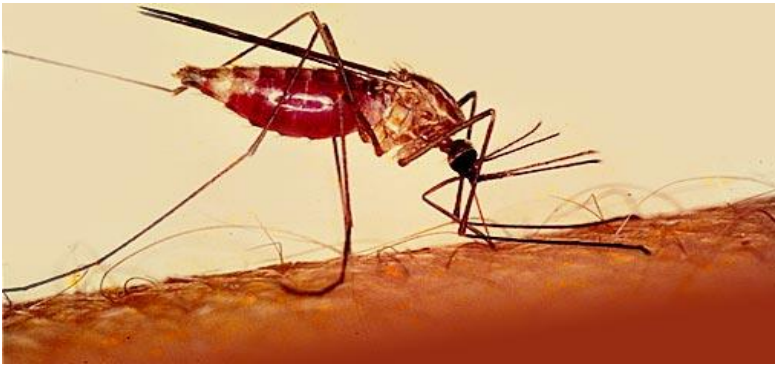

Fig. 1: The Mosquito ***(Google,2011)***

Malaria has been brought under control and even eliminated in much of Europe, the Americas and parts of Asia. However, sub-Saharan Africa is still home to the most severe and life-threatening form of malaria, caused by *Plasmodium falciparum*. Some of the reasons for this include a tropical climate, increasing drug resistance and crumbling health systems.

4.0 PARTNERSHIPS FOR MALARIA CONTROL

Successful malaria control activities require coordinated actions by everyone. In order to enhance coordination against malaria the global community has formed various partnerships. Widespread regional and international efforts to address malaria began in the 1940s and 1950s and over the years, new strategies have evolved in the effort against the disease. The first success story occurred between the early 1950s and late 1970s, when malaria was eliminated in parts of the Americas, Europe, and Asia, but such efforts did not reach or were unsuccessful in many of the hardest hit

areas, particularly sub-Saharan Africa (Centres for Diseases Control and Prevention, 2008). The efforts to reduce the menace of malaria have continued on a large scale, involving international organizations such as the World Health Organization and United Nations Children's Educational Fund (UNICEF); National authorities, especially the Ministry of Health; civil societies; Governmental and nongovernmental agencies; the private sector and the community. Some of these partnerships are relevant to this lecture and will be discussed. I have to tell you these stories so that we can all be part of the struggle to eliminate malaria.

4.1 World Health Organisation

In any given process or system, some people more than others, act as catalyst to change and development. An example of such is the group of persons who started the World Health Organization (WHO). WHO was conceived in 1945, when a group of diplomats met in San Francisco to form the United Nations. One of the matters discussed was the setting up of a global health organisation, and this was the birth of the WHO. The constitution of the WHO came into force on 7 April 1948 and this day is now celebrated as World Health Day. The founders of the WHO formed the "tip", the basis of several partnerships that sprung up and evolved in response to the deteriorating global malaria situation. In May 1998, the WHO called for a renewed attack on malaria. This rapidly evolved into the **Roll Back Malaria (RBM) Initiative.** The RBM Initiative, which was based on intersectoral partnerships, evidence-based interventions, political mobilization and participation of civil society, was officially launched in New York in October 1998 with the

WHO, the World Bank, United Nations Children's Educational Fund (UNICEF) and United Nations Development Programme (UNDP) as founding partners. The strategy of the founders was to reduce the malaria burden by building and sustaining partnerships at global and country levels, providing technical and operational support to endemic countries, stimulating research and development, and monitoring progress and outcomes (WHO, 2002).

4.2 The African Summit on Roll Back Malaria

There has been continued commitment in the effort to eradicate malaria in Africa. In Harare on 4 June 1997, there was a Declaration by the OAU on Malaria Prevention and Control in the Context of African Economic Recovery and Development, to reversing the malaria situation in Africa, and in which specific time-limited targets were set to achieve its goals. There was a new Declaration during the African Summit on Roll Back Malaria which took place in Abuja on 25 April 2000. The Summit was attended by 44 African Heads of State and governmental delegations. This resulted in the Abuja Declaration on Roll Back Malaria in Africa endorsed by all present (WHO, 2002).

4.3 Millennium Development Goals

The origins of the Millennium Development Goals (MDGs) lie in the UN Millennium Declaration, which was endorsed and adopted by the largest-ever gathering of Heads of States of 189 UN Member States on September 8, 2000. The declaration marked a strong commitment to the right to development. On behalf of their people, the world leaders signed the Declaration, which promises to free men, women

and children from the dehumanizing conditions of extreme poverty and make the right to development a reality for everyone. It was then translated into a roadmap setting out goals to be reached by 2015 (UNEP, 2011). Most relevant of these are the MDGs 4 to 6: 4 - Reduce Child Mortality; 5 - Improve Maternal Health; and 6 - Combat HIV AIDS, Malaria and other diseases. On September 25, 2008, at the Millennium Development Goal's Malaria Summit, key actors in malaria control endorsed an ambitious plan to put an end to malaria as a global health problem. The Global Malaria Action Plan (GMAP) consolidates the input of 30 endemic countries and regions, 65 international institutions and 250 experts from a wide range of fields. The GMAP aims for a substantial and sustained reduction of the malaria burden in the near and mid-terms and at an eventual elimination (UN MDGS 2011).

4.4 Multilateral Initiative on Malaria

The Multilateral Initiative on Malaria was created after an international conference on malaria in Africa held in Dakar, Senegal, in early 1997. The main goal of the conference was to strengthen and sustain, through collaborative research and training, the capability of malaria endemic countries in Africa to carry out research required to develop or improve tools for malaria control and to strengthen the research-control interphase. This conference marked the beginning of a new global focus on malaria research and capacity building three decades after a partially successful global malaria eradication program. In addition to promoting research on and institutional strengthening for malaria, the initiative was created to develop mechanisms and systems to facilitate

timely communication of information to scientists working in Africa, enhance the capacity to conduct malaria collaborative/multi-center research in Africa, and promote application of research results to address malaria control needs (RBM, 2008)

5.0 BURDEN OF MALARIA: GLOBAL MALARIA EPIDEMIC

We have been discussing the commitment of individuals and groups of people in fighting an enemy, malaria. We need to know why we consider malaria an enemy that we have to eradicate. The staggering global statistics on malaria is a picture that will challenge us all to action.

About 3.3 billion people, half of the world's population, live in areas at risk of malaria transmission in 109 countries and territories (Fig 2). The World Health Organization estimates that 243 million cases of malaria (with a range of 190–311 million) cases, occurred in 2008. The vast majority of cases (85%) were in the African Region, followed by the South-East Asia (10%) and Eastern Mediterranean Regions (4%) (Centres for Diseases Control and Prevention, 2008; WHO, 2009).

Malaria is the 5th cause of death from infectious diseases worldwide (after respiratory infections, HIV/AIDS, diarrheal diseases, and tuberculosis) in low-income countries.

In 2008, malaria accounted for an estimated 863 000 (with a range of 708–1003 million) deaths, worldwide of which 89%

were in the African Region, followed by the Eastern Mediterranean (6%) and the South-East Asia regions (5%) (WHO, 2009).

Malaria accounts for 7% of global deaths in children. Approximately, 1 in every 6 child deaths (16%) in Africa is due to malaria (WHO, 2010).

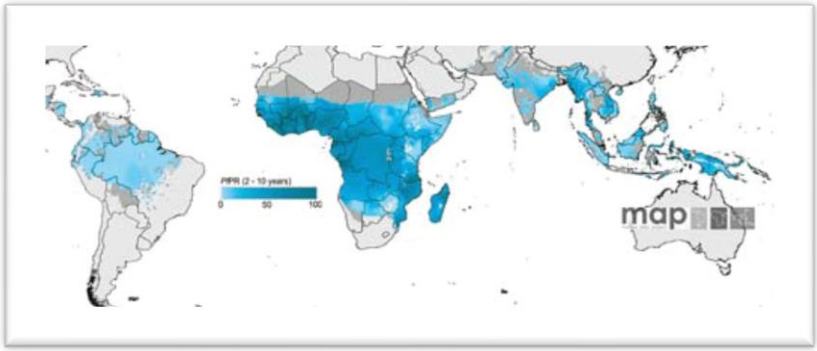

***Fig. 2: Plasmodium falciparum* malaria global endemicity.**

Source: Roll Back Malaria (2010

This figure shows the intensity of the Plasmodium falciparum parasite prevalence rates in children aged 2 – 10.) **Note: The light colour shows low intensity and the darker colour shows the highest**

Malaria causes significant economic losses and can decrease gross domestic product (GDP) by as much as 1.3% in countries with high levels of transmission. Over the long term, these aggregated annual losses have resulted in substantial differences in GDP between countries with and without malaria, particularly in Africa.

The health costs of malaria include both personal and public expenditures on prevention and treatment. In some heavy-burden countries, like Nigeria, the disease accounts for: up to 40% of public health expenditures; 30% to 50% of inpatient hospital admissions; and up to 60% of outpatient health clinic visits.

Malaria disproportionately affects poor people who cannot afford treatment or have limited access to health care, trapping families and communities in a downward spiral of poverty (RBM 2011).

6.0 MALARIA IN NIGERIA

Malaria causes more than 50% of the disease burden and can be classified as the first of the conditions causing the most illness and death in the country (Federal Ministry of Health, 2005; 2009). It is the leading condition in the areas of child health and reproductive and maternal health.

Malaria accounts for almost 50% of all-cause health expenditure, 20% of all hospital admissions, 30% of outpatient visits and 10% of hospital deaths (Onwujekwe et al. 2010). Its effects have negatively impacted on the different demographic and socio-economic groups. Malaria

is the leading condition in the areas of child health and reproductive and maternal health. It causes 11% of maternal-related mortality and at least 30% more deaths in under five children than there ought to be due to malaria (Federal Ministry of Health, 2009).

The disease carries with it two categories of costs: morbidity and mortality costs. Malaria morbidity affects households' welfare (through families' allocation to treatment and prevention of the disease), and decline in productivity, through lost time. In the case of mortality, losses to households include loss of future income and cumulative investment on the dead due to malaria as earlier reported.

Malaria has also been shown that households' incomes are depleted by 7.03% on average by the costs incurred because of malaria and the average cost to treat a case of malaria was 796.5 Naira ($6.64) for adults and 789.0 Naira ($6.58) for children with more than 95% of the people financing their treatment through out-of-pocket payment. (Onwujekwe et al. 2010).

In Nigeria, rainfall, temperature, and humidity provide the best conditions for breeding and survival of anopheline mosquitoes. Nigeria has the largest population at risk of malaria in Africa and is therefore most vulnerable to the risk of missing the MDGs target.

We now know the damage malaria is causing, the damage it has caused and the consequences of our continued ignorance of the disease. It is statistics like these that have inspired the formation of partnerships around the world, partnerships of

people and organizations, who know that they can win this war against malaria, and who have decided to keep working till that goal is achieved.

The next section presents a synopsis of our modest effort to improve the understanding of malaria and to contribute to the quest to bring about its control in the country.

7.0 MALARIA STUDIES

7.1 Interaction Between Quinine and Noradrenaline on the Vas Deferens of the Rat

Quinine is one of the oldest antimalarial agents, but its use in clinical medicine has been restricted because of its toxic effects. Quinine has spasmolytic properties and has been shown to inhibit the contractions of the gastrointestinal tract and the myocardium. To elucidate the mechanism of quinine interaction with the adrenergic receptor, we studied its effect on the vas deferens of the rat. Our results show that noradrenaline-induced contractions were potentiated, by low concentrations, 10μM of quinine but inhibited at concentrations higher than 100μM. The augmentation and inhibition of adrenergic mechanisms in the vas deferens by quinine may contribute to its toxic effects and other local actions (**Ebong** & Oriowo, 1995).

7.2 Treatment of Malaria by Drug Providers in Port Harcourt

Many Nigerians still indulge in self-medication for the treatment of their ailments. This is because of the unrestricted availability of drugs. Consequently, there is a high rate of drug abuse and misuse, and an increasing

emergence of resistance to available drugs. The message of Ministry of Health and the National Agency for Food and Drug Administration and Control has been to raise awareness on the twin problems of drug abuse and misuse, and resistance.

Uncontrolled and improper use of antimalarial drugs has encouraged the evolution of *P falciparum* drug-resistant strains. For over fifty years, the mainstay of malaria chemotherapy was chloroquine, which was both effective and affordable. We have all witnessed over the years, the change from chloroquine to artemisinin-combination therapy as the WHO first line drug. In recent times, the malaria parasite has developed resistance to chloroquine.

In 2001, we investigated the role of different categories of drug dispensers in the proper use of drugs in the mainland areas of Rivers State, including Port Harcourt (Ebong & Adiele, 2001).

The drug providers were asked to provide information on the treatment for malaria for a child below five years old presenting with symptoms of malaria. They were also asked to give reasons for their recommendations.

Chloroquine was then the WHO recommended first line drug followed by sulphadoxine/pyrimethamine. Our study showed that while an average of 70% the pharmacy attendants prescribed chloroquine correctly as first line drug, only 52% of the market attendants did so.

Our study results were evidence of the fact that our drug misuse as a nation, has contributed significantly to the

development of resistant strains of malaria. Widespread and indiscriminate use of antimalarials exerts a strong selective pressure on malaria parasites to develop high levels of resistance. Our study also recommended continuous education for drug providers and as well as consumers on the ills of drug misuse both in the dispensing of drugs and in the practice of self-medication.

7.3 Indigenous Health Care Givers and Herbal Management of Febrile Illnesses in Rivers State

This study investigated the ethno-medicinal uses of plants among traditional health care givers in two rural communities: Kaani and Boue, in Khani Local Government Area and, one urban community: Eleme, in Eleme Local Government Area, all in Rivers State. The study solicited for information from traditional health care givers on characterization and herbal management of febrile illnesses.

The investigations involved in-depth interviews conducted with care givers comprising indigenous healers, herbalists, sellers of herbal remedies, and community elders. Information was obtained on the types of fevers treated; symptoms and methods of establishing illness; traditional herbs used in the prevention and treatment of fevers.

Our results showed that these care givers classified the types of fevers they treated as: malaria; typhoid; yellow fever; convulsion; and what they called, ***high fever*** and ***pregnancy fever*** in order of frequency. Our traditional healers also categorized these fevers as: those accompanying yellow eyes; headache; waist pain; and joint pains.

Majority of respondents diagnose fevers by physical examination, listening to patients' complaints and by divination and inspiration. The treatment used for the fevers, were herb teas; herb powders; incantation in addition to performing some sacrifice; and use of some special fluids.

Majority of the respondents said that "dogonyaro" (*Azadiracta indica*) was the best herbal medicine for the treatment of fevers. In many parts of Nigeria, "dogonyaro" is a major component in the ethnomedical management of fevers. Our study thus confirmed the general claims on the use of the plant.

Other herbal preparations used by the health care givers include: lemon grass, *Cymbopogon citrates*; mango bark, *Mangifera indica*; lime fruit, *Citrus limetta*; pawpaw leaf and fruit, *Carica papaya*; guava leaf, *Psidium guajava*; akpagbogoro, *Salacia nitida*; plantain sucker, *Musa sapientum*; Lipton tea and the scent leaf, Occimum *gratissimum*. Lemon grass, lime, and mango bark, stand out clearly as herbal preparations which were reported to be more frequently used in Rivers State and in other parts of the country (**Ebong** et. al., 2005; Ajaiyeoba et al., 2003).

The local health care givers in our study claimed that they treated more cases of malarial fevers than any other fevers. Since malaria is endemic in these communities, it may not be too difficult for traditional healers to accurately diagnosis the disease from well-known symptoms. However, this approach alone, without the facility for laboratory diagnosis, increases the possibility of misdiagnosing, as malaria, other types of fever which are not malaria. Since most of the traditional practitioners treat their patients with herbs

containing different plant mixtures, some of these herbal treatments may be no more than guess work, and sometimes patients are kept until their condition deteriorates before the practitioner considers referring them to the hospital for orthodox treatment.

7.4 Antiplasmodial Effects of the Aqueous Extracts of Some medicinal plants against *Plasmodium berghei.*

We have earlier noted the increasing burden of malaria, mainly due to the increasing resistance of *Plasmodium falciparum* against widely available antimalarial drugs. New, more affordable and effective antimalarial agents possessing original modes of action have been introduced. Unfortunately, first reports on drug resistance to artemisinin-derivatives (Jambou et al., 2005), and to drug combination therapies (Wichmann, 2004) have already appeared. So, in the absence of a functional, safe and widely available malaria vaccine, efforts to develop new antimalarial drugs continue to be urgently needed now.

Natural products have played a dominant role in the discovery of leads for the development of drugs to treat human diseases. Indeed, new antimalarial leads may certainly emerge from tropical plant sources. The antiplasmodial effects of plants such as *Phyllantus amarus, Carica papaya* (pawpaw) *Cymbopogon citratus* Stapf (lemon grass) were investigated. Our studies on mice infected with rodent plasmodium, *Plasmodium berghei,* showed that some of the plants used locally in the treatment of malaria, and in the treatment hypertension and yellow fever, have curative antiplasmodial activities (Dapper,

Aziagba & **Ebong** 2007; Dapper, Siminialayi & **Ebong** 2008; Amazu, **Ebong**, Azikiwe et al, 2009).

7.5 Efficacy of Highly Active Antiretroviral Therapy (HAART) regimens on *Plasmodium berghei* in vivo in the mouse.

The interaction of HIV and Malaria is of increasing public health concern. Malaria and HIV are two of the most devastating global health problems of our time. The two diseases have many things in common, in that both are endemic in the sub-Saharan Africa, Southeast Asia, South America and certain cities of India (WHO, 2004). The diseases are also known to have a higher proportion of co-infection in these geographical regions of overlap. Both are concentrated in the same region, sub-Saharan Africa, and many countries with endemic malaria also have endemic HIV/AIDS. Co-infection of patients with HIV and malaria is very common in Africa and of course Nigeria. This has markedly increased the mortality rate of HIV patients in Sub Saharan Africa, when compared to their counterparts in Europe and America. Studies have shown that HIV infection increases the incidence and severity of clinical malaria and that dual infection enhances the spread of both diseases in endemic regions (Cot & Deleron, 2010).

Studies have shown that antiretroviral protease inhibitors may have antiplasmodial effects (Skinner-Adams, Mccarthy & Gardiner, 2004). Therefore, we investigated drugs in the 'Highly Active Antiretroviral Therapy (HAART) group for antiplasmodial effects in mice *in vivo*. One group of drugs did not include protease inhibitors: Zidovudine +

Lamivudine + Efavirenz combination (5-20mg/kg) [Regimen1]. The second group of HAART include protease inhibitors: Zidovudine + Lamivudine and lopinavir boosted Ritonavir combination (5 – 20mg) [Regimen2]. The blood schizonticidal activities of the HAART drugs were investigated for repository, early and established infections. Control mice received dimethyl sulfoxide (0.2ml), Chloroquine (5mg/kg) and normal saline (0.2ml).

The results of the study show that, of the two regimens, Regimen 2 containing a protease inhibitor had twice as much antiplasmodial efficacy than the one without. Chloroquine 5mg/Kg cleared parasitaemia within 7days. Dimethyl sulfoxide and normal saline did not inhibit parasite growth (**Ebong**, Ogbuehi & Omogbai, 2009).

These results are of interest because we confirmed the antiplasmodial potency of protease inhibitors. It has been suggested that the combined synergistic effects of drugs in HAART regimen enhance the host's immune system and may contribute to the antiplasmodial effects of the drugs. This will optimize treatment of co-infected patients. It is therefore expedient to determine the drug interactions and tolerability of HAART regimen with other antimalarial agents so that information obtained from such studies can contribute to policy on antimalarial drugs in the treatment of HIV/AIDS patients and in co-administration of antiretroviral drugs as anti-malarial agents. Studies like this will greatly contribute to a reduction in the menace of malaria aggravated by HIV infection and vice versa and ultimately ameliorate the mortality rate of HIV patients due to malaria especially in children and in pregnant women.

8. GRANTS & FUNDED PROJECTS

8.1 The World Health Organization (WHO)/The Special Programme for Research and Training in Tropical Diseases (TDR) /Multilateral Initiative on Malaria (MIM) Project

Mr. Vice-Chancellor, I have benefited from the WHO/MIM programme. We worked as a multidisciplinary group involving the Department of Pharmacology, University of Port Harcourt; the Department of Pharmacology University of Ibadan and the Post Graduate Institute of Medical Research and Training (PIMRAT), University of Ibadan, and obtained sponsorship to carry out a phytomedicinal project titled "Identification and Clinical Evaluation of Potential Antimalarial Components from the Nigerian Phytomedicine Compendium". The phytomedicine grant culminated in the establishment of the **Malaria Phytomedicine Research Laboratory,** which was officially commissioned by the then Vice-Chancellor, Prof. Nimi D. Briggs in 2003.

The entrance of the **WHO/TDR/MIM** project provided the first equipment for pharmacological and phytomedicinal studies. We also built a multidisciplinary group of research scientists and physicians and have been able to carry out studies in malaria and other areas of pharmacology. The project has also brought about a steady increase in the number of Masters and Ph. D students in Malaria, and Phytomedicine studies in the Department of Pharmacology, from 2 in 2002 to more than 8 in 2010.

8.2 The World Bank Project

The World Bank is an institution that came into being following the United Nations Monetary and Financial Conference in Bretton Woods, New Hampshire, United States, in 1944. The World Bank gives out loans to member countries, the world over, to meet environmental and infrastructural requirements. The Bank has made capital available to several developing and under-developed nations to improve exports, attain economic equanimity and at the same time guarantee citizens' upgraded utilities and services. In 2008, the University of Port Harcourt received a grant from the World Bank/ Federal Ministry of Education Science and Technology Education Post Basic (STEP-B) Project in Nigeria for the upgrading of facilities in the Malaria Phytomedicine Laboratory. With that grant we have acquired new and modern equipment for research which has enhanced and expanded our research base.

Some of the on-going studies in the laboratory under the STEP-B project include:

i). A survey of malaria treatment patterns by health care providers and pattern of anti-malarial drug use was carried out in four districts of Port Harcourt; the old Port Harcourt, Borokiri, Main town, Diobu and Trans Amadi Industrial Area. Care providers in the orthodox and traditional settings were included.

ii) A comparative study on the efficacy and safety profile of some Artemisinin-combination therapies on *Plasmodium berghei* in Swiss Albino Mice

iii). The pattern of use of artemisinin-combination therapies in Port Harcourt.

8.3 African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA)/ International Atomic Energy Agency (IAEA) Project

In March 2010, the University of Port Harcourt benefitted from the International Atomic Energy Agency (IAEA) Project titled "Applying Molecular Techniques To Interventions Against the Major Poverty Related Diseases (HIV, TB, and Malaria) for Improving Disease Control" RAF 6/040). The Malaria Research Laboratory was designated the Country Coordinating Centre under the Nigerian Atomic Energy Agency.

We have completed the protocol and obtained ethical clearance for a study titled: "Studies on Molecular Epidemiology of Malaria in Port Harcourt, Nigeria". We hope to begin sample collection on this study later in the year.

9.0 INVOLVEMENT IN NATIONAL HEALTH PROGRAMMES

My interest in health research has provided the platform from which I have been able to take part in some national health programmes in the country.

9.1 Global Fund t*o fight AIDS, Tuberculosis and Malaria*

The Global Fund is an organization that works in close collaboration with other bilateral and multilateral organizations to supplement existing efforts dealing with the three diseases. Since its creation in 2002, the Global Fund has become the dominant financier of programs to fight HIV, tuberculosis, and malaria, with approved funding of US$ 21.7 billion for more than 600 programs in 150 countries.

The Country Coordinating Mechanism (CCM) Nigeria was launched on the 5th of March 2002 and its mandate is to develop and submit viable and appropriate proposals to the GF and to oversee and support the implementation of projects that are initiated by the CCM and financed by the Global Fund.

The Global Fund invests the world's money to save lives. To date, the CCM Nigeria has coordinated and presented Country proposals from Government, Non- Governmental Organizations, Civil Society Organizations etc. to Global Fund with an estimated US$ 1.1 billion, about (₦93, 715, 117,020) over the years, on HIV/AIDS, Tuberculosis and Malaria (Gwaivangmin, 2010). This huge grant portfolio is used to provide medicines and other facilities for the three diseases.

Mr. Vice-Chancellor, Sir, I became a full member of the Country Coordinating Mechanism (CCM) Nigeria in 2006 through my membership of the Network for HIV/AIDS In Nigeria (NARN). Today, I am the first Vice-Chair of CCM

Nigeria. I am proud to say that I have been a part of this success story; that is, the story of saving lives.

10. CENTRE FOR MALARIA RESEARCH AND PHYTOMEDICINE

The re-designation in December 2010, of the 'Malaria Research Laboratory' as the 'Centre for Malaria Research and Phytomedicine' by the Governing Council of the University of Port Harcourt, marks the high point of my research career. By this re-designation, the Centre is better placed for national and international recognition and for attracting collaboration and funding. We are hopeful that this Centre will grow to become a leading Centre in malaria research and be globally recognized in the fight against malaria and other poverty-related diseases.

I will gladly now invite you all to join the Centre in its activities aimed at malaria eradication and in the search and development of more effective and more affordable new anti-malaria drugs; and other phytomedicines.

11. COMING TOGETHER TO ROLL BACK MALARIA IN NIGERIA

The points of emphasis of my malaria research have been on education and prevention as well as treatment. Each one of the three is as important as the other for rolling back malaria in Nigeria. I hope we shall all today, be part of the movement to roll back malaria in our community.

Education: Information is a not insignificant part of the battle against malaria. Everyone needs to know the cause of and treatment for malaria. Malaria is not caused by the hot sun or red oil. Malaria is caused by the infection of red blood cells with protozoan parasites of the genus *Plasmodium*. The parasites are inoculated into the human host by a feeding female anopheline mosquito. The four *Plasmodium* species that infect humans are: *P. falciparum; P. vivax; P. ovale;* and *P. malariae*. Increasingly, human infections with the monkey malaria parasite, *P. knowlesi*, have also been reported from the forested regions of South-East Asia. We need to educate ourselves, and indeed, members of the public, on the cause and prevention of malaria.

Prevent Malaria Infection: The best way to prevent malaria infection is to prevent the malaria-carrying *anopheles* mosquitoes from biting us. We can destroy larval breeding sites of the mosquitoes by using insecticide indoor residual sprays or outdoor sprays. Prevention can also be achieved by use of insecticide-treated nets and the newer longer lasting insecticide-treated nets which are one of the most cost-effective methods of malaria prevention.

As a preventive measure, pregnant women, who are very vulnerable and frequently targeted, are given intermittent preventive treatment with antimalarial drugs, most often at antenatal consultations during the second and third trimesters of pregnancy. Prevention is an important component of malaria control.

Prevention and Treatment with Medicines: Drugs play a very important role in the elimination of malaria by

eliminating the parasites in the blood. These parasites are the actual forms that cause the disease. It is important that drugs are taken as prescribed. The World Health Organization specifically recommends Artemisinin-based Combination Therapies (ACTs) as the best treatment for malaria.

Case Management, Diagnosis and Treatment: The World Health Organization recommends early diagnosis and prompt, and appropriate treatment of malaria for children, and that anyone suspected of having malaria should receive diagnosis and treatment with an effective drug within 24 hours of the onset of symptoms. ACTs are recommended treatment for uncomplicated *P. falciparum* malaria (WHO, 2010). Treatment with an effective drug means, buying drugs from accredited dealers and not from drug hawkers, drugs bought should be taken only as prescribed by a medical professional, and the complete dosage should be taken. Under the Global Fund project, Affordable Medicines Facility malaria (AMFm) has been launched to roll out ACTs. These drugs are now made available and affordable.

Financing of Malaria Control: Our communities and organizations, should invest in malaria control; committing some resources to saving lives, especially of the under-fives and pregnant women. The population at risk will then reduce.

We should all today, be part of the movement to “roll back” malaria in our community.

12. CONCLUSION

Mr. Vice-Chancellor Sir, I got the inspiration for this lecture from Malcolm Gladwell's book: **The Tipping Point - How *little* things can make a *big* difference".** In this book, Gladwell defined 'the Tipping Point' as 'the biography of an idea. Gladwell said, the idea is very simple. "It is the best way to understand the emergence of fashion trends, the ebb and flow of crime waves, or, for that matter, the transformation of unknown books into bestsellers, or the rise of teenage smoking or the phenomenon of word of mouth, or any number of the other mysterious changes that mark everyday life". He said, the idea is to think of them as epidemics. 'Ideas and products and messages and behaviors spread just like viruses do'. The lesson of Malcolm Gladwell's book is that, **one person, or a group of persons can make the difference and cause a positive change, cross a threshold or 'tip' and take off, in order to advance a cause** (Gladwell, 2000). This is the message for malaria control and elimination. This is the message of this 75th Inaugural lecture. That is why I have titled it: **'Rolling Back Malaria in Nigeria: The Law of the Few'.**

Today, the battle to eliminate this enemy continues. So much effort is being made globally, in Africa, and in Nigeria to reduce the impact of the disease. Let us all join in this battle. It may be you; it may be me that will cause the tip, the change. I have taken up this fight through my research efforts and work in the CCM, and lately, with the Centre for Malaria Research and Phytomedicine. The tipping point will be the point of full commitment to the eradication of malaria

by everyone. This is something we can achieve: **Roll Back Malaria in Nigeria**.

I was reading the section on "Quotable Quote" of Peoples' Daily Newspaper of March 25, 2011, and I saw on the back page, a quotation from Adolph Monod, "Between the great things we cannot do and the small things we will not do, the danger is that we shall do nothing"**.** This saying is very appropriate to the message of this lecture.

The challenge for all of us today is not just to do the little we can, but to do the little we have to do very well.

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CITATION ON PROFESSOR OMOTAYO OLURANTI EBONG

By
Prof D V Dapper

Introduction:

Mr. Vice-Chancellor Sir, the 75th inaugural Lecturer of the University is none other than Professor Omotayo Oluranti Ebong.

Professor Omotayo Oluranti Ebong was born on the 15th of December 1948 in Lagos State to Deacon Akinlabi Oloyede Adekunle and Mrs. Helena Olabisi Adekunle. She is the first in a family of four.

Education:

She attended Holy Child College, Ikoyi, Lagos, 1962 to 1966 to obtain the West African School Certificate O' Levels and Baptist High School, Iwo, Oyo State, in 1971 to obtain the Higher School Certificate A' Levels. After this she proceeded to the University of Ibadan, Nigeria from where she

obtained a Bachelor of Science [BSc] Honors degree in Pharmacology in 1975. She then went to the Ahmadu Bello University, Zaria, Nigeria for a Master of Science [MSc] degree in Toxicology in 1978. In further search of the proverbial Golden Fleece, she went to the world-famous University of Newcastle upon Tyne in England and bagged a Doctor of Philosophy [PhD] degree in Pharmacology in 1982. Professor Omotayo Oluranti Ebong is clearly a world trained and renowned Pharmacologist of international repute.

Academic career:

While pursuing her Ph.D. degree she worked as a Research Assistant with the Department of Pharmacological Sciences of the University of Newcastle upon Tyne, England. On completion of her Ph.D degree, she returned to Nigeria in 1982 to join her husband at the Ahmadu Bello University, Zaria. Prior to leaving for England, she was already an academic staff with the same University where she was a Graduate Assistant 1976 to 1978 and Assistant Lecturer in 1978. In 1983, she joined the University of Port Harcourt, Nigeria as a Lecturer Grade I in the Department of Pharmacology of the College of Health Sciences. She was subsequently promoted to the rank of a Senior Lecturer in Pharmacology in 1985 and in 2000 was appointed to a full chair in Pharmacology [Professor of Pharmacology] a position she has occupies till date.

Prof Ebong was appointed a visiting Senior Lecturer to the Department of Pharmacology and Therapeutics of the University of Ibadan from 1991 to 1992; and a visiting Professor to the Department of Pharmacology, Niger Delta University (NDU), Amassoma, from 2006 -2007.

Administrative experience and academic leadership:
Professor Omotayo Oluranti Ebong has provided academic leadership with a wide range of responsibilities in her career as a senior academic. She started as the Coordinator of the Department of Pharmacology, College of Health Sciences, University of Port Harcourt from 1983 to 1985 has acted variously as acting Head and Head of the Department of Pharmacology, University of Port Harcourt from 1983 to 1985; 1987 to 1989 to 2001 and 2003 to 2005. She served as Dean, Faculty of Basic Medical Sciences of this University from 2003 to 2005 during which she gave purposeful direction to the then young Faculty of Basic Medical Sciences.

Between 2006 and 2007 she served at the Niger Delta University, Ammassoma, Bayelsa State as Head, Department of Pharmacology and Dean, Faculty of Basic Medical Sciences.

She was Senate representative in the University Publications Committee from 1988 to 1990; Member, Curriculum Committee of the College of Health Sciences from 1988 to 1991; College Appointments and Appraisals Committee from 1992 to date; Coordinator, Post-Graduate program of the Department of Pharmacology, University of Port Harcourt, 1995 to 2000. Professor Omotayo Oluranti Ebong is currently the Director, Centre for Malaria Research and Phytomedicine, University of Port Harcourt; a position she has used to bring the University to the forefront of the international scientific community.

Research career:
Professor Omotayo Oluranti Ebong is an avid researcher whose quest for specialist and specialized knowledge

knows no bounds. She has indeed had very fulfilling research career; as attested to by the quality of her research publications in various learned journals and her membership and fellowship of several societies

Professor Omotayo Oluranti Ebong has over 34 full length articles in various national and international journals, 4 monographs [all of national and international import; written for the Federal Ministry of Health and Social Services and the World Health Organization], 5 chapters in books and 2 full books. Her books are used as reference for teaching of undergraduate and post graduate Pharmacology in Nigeria.

Her research has attracted many grants and support in recognition of her research endeavours; this has been to the benefit of the University and provided opportunities to many younger academic staff of the Faculty of Basic Medical Sciences for whom she has acted as mentor and a role model worthy of emulation. Some of these grants include: International Atomic Energy Agency Project: Applying Molecular Biology Techniques to Interventions against major Poverty Related Diseases [HIV, TB and Malaria], 2009 ; MacArthur Centre for Excellence Planning Grant: Strengthening Teaching and Research Capacity in Malaria Phytomedicine and Chemotherapy; World Bank/Federal Ministry of Health/STEP-B Project 2008; Upgrade of the Malaria Phytomedicine Research Laboratory, University of Port Harcourt; and a number of World Health Organisation/TDR/Federal Ministry of Health projects in support of research and training in Primary Health Care in tropical diseases, to mention but a few!

Professor Omotayo Oluranti Ebong has attended various training workshops and conferences in Nigeria and across the world where she has presented numerous papers and served as resource person for academic discourse.

She is a current Member and Fellow of several professional and learned societies amongst which include African Scientific Institute; Network for HIV/AIDS Research in Nigeria; West African Society for Pharmacology, New York Academy of Sciences, Physiological Society of Nigeria, National Association of Women Academics [NAWACS] and Organization for Women in Science for the Developing World [OWSDW].

University Service:

Professor Omotayo Oluranti Ebong has been of immense service to the University of Port Harcourt specifically and to the University system in Nigeria generally. Aside from serving as Head of Department and Dean of Faculty mentioned above, she has been member of several University Boards including College of Continuing Education 2009 to date; University Demonstration Secondary School, University Demonstration Primary School 1985 to 1987 and 1990 to date; University Science and Engineering Workshop 1990. She has also served as College of Health Sciences representative in the University Library Committee 1995 and as member of University of Port Harcourt Senate 1983 to 1984, 1987 to 1990 and 2000 to date. She was Hall Warden, King Jaja Hall 1987.

Above all this she is currently serving as a Member of the Governing Council of the University from 2009 to date; a position in which she has brought her wealth of experience

to bear in the overall management of the affairs of the University.

Professor Omotayo Oluranti Ebong has served as External Examiner to several Nigerian Universities amongst which include: Universities of Lagos, Nigeria, Ibadan, Benin, Lagos State University, Obafemi Awolowo University Ile Ife and Nnamdi Azikiwe University, Awka.

National Service:
She has served the Nigerian nation in several forum and capacities; she is still able and willing to serve her country. At the moment, she is a Member and the First Vice-Chairman, Country Coordinating Mechanism [CCM], Nigeria of the Global Fund for HIV/AIDS, Malaria and Tuberculosis [ATM] from 2010 to date. She has also been a member of the several National Universities Commission Accreditation Panels to six Universities

Private Life:
Who can find a virtuous wife? For her worth is far above rubies. The heart of her husband safely trusts her; so he will have no lack of gain. She does him good and not evil all the days of her life (Prov. 31:10-12. NKJV) Professor Omotayo Oluranti Ebong is happily married to Professor Mbuk Ebong a retired Professor of Engineering Surveying at the Faculty of Engineering of the University of Port Harcourt. Professor Mbuk Bendict Ebong can no doubt attest that he lacks no gain in his loving and dutiful wife. The marriage is blessed with 6 children: Eme Uwem, Eno, Ubon, Udeme and Akanimo.

Professor Omotayo Oluranti Ebong is a grandmother, and she has no doubt brought forth an Ebong dynasty.

She is a devout Catholic and a Lady Knight of the Order of Saint John International of the Catholic Church.

Conclusion:
Professor [Mrs.] Omotayo Oluranti Ebong is a woman who has devoted her life and time to the service of the University of Port Harcourt and to her country. She is dutiful wife and loving mother, a pharmacologist of international repute, an avid researcher and outstanding academic. A consummate University administrator, a mentor and role model worthy of emulation to several young academics in Nigeria especially in the University of Port Harcourt.

Mr. Vice-Chancellor Sir, I would like to end this citation with two quotations that I consider most appropriate. The first is to all of us here present and is from late Earl Nightingale the American motivational speaker:

"People with goals succeed because they know where they're going."
The second is especially to our inaugural lecturer and is from Louis Dearborn L'Amour the late American author:

"There will come a time when you believe everything is finished: That time will be the beginning."

Ladies and gentlemen, it is my honour and indeed a privilege to present to you Professor Omotayo Oluranti Ebong, the 75th inaugural lecturer of the University.

Mr. Vice-Chancellor Sir, I am done. Ladies and gentlemen, thank you all for your kind attention.