



**MICROORGANISMS, MICROBIAL
PRODUCTS AND CHRONIC
DISABLING DISEASES OF HUMANS.
NEW INSIGHTS**



**of the Federal University of Technology, Owerri.
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BY

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Protocol

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Preamble

Inaugural lectures are part of the rich academic traditions of universities worldwide. An inaugural lecture is given by a lecturer promoted or appointed newly to the rank of Professor. In Nigeria, the history of inaugural lectures dates back to 17th November, 1948 with a presentation by Paul Christopherson, a Professor of English entitled "Bilingualism" at the then University College, Ibadan" (Nwajuba, 2012). In our great university, thirty-three inaugural lectures have been delivered with Professor G.O.C Obah blazing the trail with his presentation on 17th December, 1986 entitled, "*Communication in the service of a Nation*".

According to the new guidelines for preparation of inaugural lectures of the Federal University of Technology Owerri Nigeria, an inaugural lecture is expected to highlight the individual's contributions to knowledge, emphasizing depth of research, knowledge gap and showing the way to further research. By the same guidelines, the lecture should last between 60 and 90 minutes and not exceed two (2) hours.

My early education which by implication began my formation as a scientist started at the Agbani Road Primary School Enugu in the 1970s. The quest for secondary education took me initially to Community Secondary School Amuzi, Ahiazu Mbaise and later to the premier, Mbaise Secondary School Aboh-Mbaise where I earned the West African School Certificate (WASC) in 1980. As the first child/son of Sr. Celestine Nosike Dozie of blessed memory, a disciplinarian by nature and shrewd accountant by training and Lady Mary Ahunna Dozie, an ever smiling, loving and empathic woman by nature and teacher by vocation, the desire for tertiary education saw me enroll in the only University in Nigeria sited on soft green hills, the University of Nigeria Nsukka where I bagged both the Bachelor of Science and Master of Science degrees under the supervisions of Professor O.F.C. Nwodo and Dr. N.C. Unaeze respectively

Finally, the hunger for the highest academic laurel in the land the doctorate degree, took me to the highlands of the Plateau where I earned the valued degree in Parasitology and Entomology at the University of Jos, Plateau State, Nigeria in 2002 under the caring and expert supervision of two of Nigeria's finest scientists, Professor C.O.E. Onwulin, FAS of blessed memory as major supervisor and Professor B.E.B. Nwoke, FAS as co-supervisor.

Therefore, as a young biomedical scientist brought up under the guidance of my teachers and in the course of my career as a teacher, I carried out several studies on microorganisms and their products including diseases caused by those microorganisms. Such diseases of grave public health and socio-economic importance include onchocerciasis (or river blindness), schistosomiasis (or bilharziasis), dracunculiasis (or guinea worm), loiasis, Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS), tuberculosis, malaria, cryptosporidiosis etc. In addition, I conducted studies on some non-communicable chronic disabling conditions of humans whose rising contributions to the total disease burden in terms of mortality and morbidity have become worrisome. Such non-communicable chronic diseases include high blood pressure, cancer, diabetes, obesity etc.

However, the most important of these studies which I consider significant for the purpose of an inaugural lecture are: studies on the ecology, pathogenicity and physiology of the important but little studied and almost forgotten fungus, keratinophilic fungus; studies on onchocerciasis (or river blindness), the debilitating chronic parasitic disease of people living at the end of the road with grave socioeconomic consequences and studies on the prevalence and factors responsible for the rising tide of non-communicable chronic diseases in Nigeria.

From these studies, I made modest contributions that actually shaped the beginning of my eventual career as a teacher at the Imo State University, Owerri, in September, 1992, the

culminated into my promotion to the prestigious rank of Professor of Microbiology (with specialization in Medical Microbiology and Parasitology) in October, 2005.

Since, I consider the trio of keratinophiles, onchocerciasis and non-communicable chronic disorders of man, the core of my contributions for the purpose of an inaugural lecture; I have entitled this lecture therefore: **"Microorganisms, Microbial Products and Chronic Disabling Diseases of Humans. New Insights.**

Mr. Chairman and distinguished audience, I deeply appreciate God Almighty for the special privilege of being a teacher, for the passion I have for this profession and for making today's presentation, the 34th in the Inaugural Series of our great university possible. Similarly, I thank our dear Vice-Chancellor and Chairman of the Inaugural Lecture, the affable Professor of Physics with natural cool-cucumber personality and confident demanour, Professor Francis Chukwuemeka Eze for granting approval to this presentation.

This lecture is dedicated to Mary, our blessed mother and Lady of Perpetual Help for her constant motherly intercessions and to the most affectionate and loving blessed memories of four (4) people; three (3) great men who impacted my life positively; firstly, "the Celestines"; Celestine Dozie, my father and Celestine Onwuliri, a mentor; secondly, Charles Okeke, a brilliant scientist and teacher turned Catholic priest who taught me the rudiments of independent research work as a student and lastly, Lady Patricia Obioma Ajaero, mum-in-law par excellence and a woman with uncommon golden heart that stopped beating on June 21, 2017 as preparations for this lecture was on-going. May their gentle souls and the souls of all the faithful departed through the mercy of God rest in peace. Amen.

CHAPTER ONE

1.0 Introduction

1.1 Definition of basic concepts

Microbiology is the study of very minute living organisms that cannot be seen by the unaided human eye, called microorganisms. Microorganisms have a wide taxonomic distribution. They include bacteria, protozoa, fungi, viruses and many algae. The existence of microorganisms was not known until the invention of the microscope in 1677 by Antonie Philips van Leeuwenhoek (1632-1723) who was a Dutch Merchant (Davis, 1980). Leeuwenhoek was endowed with an unusual degree of curiosity. He studied almost every conceivable object that could be looked at using his single-lens microscope. He described the main kinds of unicellular microorganisms that are known today namely; the major classes of bacteria (spheres, rods and spirals), protozoa, algae and yeasts. He called these organisms "animalcules" or little animals. Leeuwenhoek is regarded as the Father of Microbiology on account of his discovery of the microbial world.

Microbial products are products derived from various microscopic organisms. Microbial products may consist of the organisms themselves and/or the metabolites they produce. Examples are enzymes, vitamins, antibiotics, endotoxins, amino acids etc. These products have important applications in the environment, food and beverage industry, medicine, pharmaceutical industry etc.

Disease is regarded as a disorder of structure or function in a human, animal or plant, especially one that produces specific symptoms or that affects a specific location and is not simply a



direct result of physical injury. There are two types of diseases namely; communicable and non-communicable diseases. A communicable disease, otherwise, known as an infectious or contagious disease can be defined as "an illness due to a specific infectious agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector or the inanimate environment." Examples are Ebola, HIV/AIDS, malaria, onchocerciasis, guineaworm etc. Communicable diseases can be acute (i.e. of short duration). Example is Ebola. They also can be chronic (i.e. of long duration). Example are onchocerciasis (or river blindness) and HIV/AIDS.

A non-communicable disease (NCD) is a medical condition or disease that is not caused by infectious agents (i.e. non-infectious or non-transmissible). It is a disease which has silent or insidious onset, progresses slowly for a long period of time and often without symptoms. They are chronic conditions. Examples are cancers, diabetes, hypertension, obesity etc. In the succeeding chapters, I will discuss in details keratinophiles, onchocerciasis and non-chronic diseases of humans.

CHAPTER TWO

2.0 Ecology, pathogenicity and physiology of keratinophiles

2.1 Ecology of Keratinophilic Fungi

Keratinophilic fungi are microorganisms that have special affinity for keratin. They include *dermatophytes* and other related fungi such as *Chrysosporium* species. *Dermatophytes* consist of three different genera namely: *Trichophyton*, *Microsporum* and *Epidermophyton*. Generally, dermatophytes cause diseases known as dermatophytosis (or ringworm) as opposed to dermatomycoses which include skin infections such as tinea vesicolor, black piedra white piedra etc caused by other superficial fungi such as *Malassezia furfur*, *Piedraia hortae*, *Trichosporon cutaneum*. The ecology of keratinophilic fungi consists mostly of soils and coats of wild or domestic animals from where they are frequently isolated using the Toma-Karling-Vanbreuseghem (To-Ka-Va) hair-baiting technique (Chabasse, 1988).

In Nigeria, information on keratinophilic fungi was scanty, besides the report of Okafor and Gugnani (1981) who recovered some of these fungi from hairs of rodents. There were no published reports on isolation of keratinophilic fungi from soil.

2.1.1 Findings/Contribution to Knowledge and Discussion

In our studies, we isolated 45 keratinophilic fungi distributed in four genera and seven species from different soil samples investigated in Nsukka, south eastern Nigeria using the To-Ka-Va hair-baiting technique (Dozie et al., 1994a). The organisms recovered included, *Chrysosporium keratinophilum*.

Chrysosporium tropicum, *Chrysosporium* species, *Fusarium oxysporium*, *Fusarium solani*, *Microsporium gypseum* and *Geotrichum* species (Table 1). *Geotrichum* species (31.1%) was the most isolated fungus followed by *Chrysosporium keratinophilum* (22.2%) while *Fusarium solani* (4.4%) was the least isolated fungus.

The density of fungi was higher in soil samples with rich organic keratin matter such as dairy farm, goat farm, poultry farm and animal sections of the market than those with poor organic keratin matter, such as barber's saloon. The higher recovery from soil samples with rich organic keratin was a confirmation of previous findings by Sur and Ghosh (1980) in India.

The isolation of *Geotrichum* species from soil in Nigeria was surprising as there are no previous reports of its isolation from soil using the hair-baiting technique. However, the high recovery using chicken feather bait is an indication of its affinity for keratin, especially for chicken feather keratin. Generally, the bait-specificity studies of each fungus showed that chicken feather was better selective bait than human hair (Dozie et al., 1994a).

The presence of *Chrysosporium keratinophilum*, *Chrysosporium tropicum* and other chrysosporia species in soil samples from Nigeria was a confirmation of earlier studies (Sur and Ghosh 1980; Chabasse, 1988). The cosmopolitan distribution of *Microsporium gypseum* was further established in our study with its isolation. It is notable that *Microsporium gypseum* is a well known geophilic dermatophyte responsible for occasional human and animal dermatophytic infections commonly called dermatophytosis (Dozie et al., 1998).

Table 1: Keratinophilic fungi recovered from Nsukka soils

Species isolated	N ^o of isolates	% of total isolates
<i>Chrysosporium keratinophilum</i>	10	22.2
<i>Chrysosporium tropicum</i>	5	11.1
<i>Chrysosporium</i> species	4	9.0
<i>Fusarium oxysporium</i>	5	11.1
<i>Fusarium solani</i>	2	4.4
<i>Microsporum gypsum</i>	5	11.1
<i>Geotrichum</i> species	14	31.1
Total	45	100

2.2 Pathogenicity of *Chrysosporium* species

Besides geophilic or zoophilic dermatophytes, the pathogenicity of other keratinophilic fungi and in particular the genus *Chrysosporium* is uncertain. However, the epidemiological importance of soil or wild animals as potential sources of mycotic infections (Chabasse, 1988), the phylogenetic relationship between keratinophilic *Chrysosporium* and dermatophyte, and the transition from saprophytism to parasitism of some species such as *Anixiopsis stercoraria* (Gueho et al., 1985) necessarily imply the potentials of *Chrysosporium* to be pathogenic. Accordingly, we investigated the pathogenicity of several geophilic *Chrysosporium* species in a mouse model using three to four week old white male mice (Dozie et al., 1998).

2.2.1 Findings/Contribution to Knowledge and Discussion

Our results showed the ability of *Chrysosporium* species to induce erythematous lesions in white male mice four to six days after inoculation. These lesions resolved spontaneously after four weeks and disappeared after five weeks. No real hair invasion typical of dermatophytic endothrix infection was

seen. Though the pathogenic character of these fungi could not be firmly established, yet their ability to induce erythematous lesions and remain viable for several weeks on the skin indicate that they may become pathogenic under conditions of compromised host immunity. Generally, the success in producing experimental tinea lesions in laboratory animals has been reported to depend on a number of factors.

2.3 Description of thermostable, alkaline-active keratinolytic proteinase from *Chrysosporium keratinophilum*

Enzymes involved in keratin degradation are known as keratinolytic proteases or keratinases. Although, keratinolytic proteinases by keratinophilic fungi are well documented (Warwrzkiewicz et al., 1987), there are few reports on the production of thermostable proteinases by this group. Highly thermostable proteinases have mainly been isolated from bacterial species (Takami et al., 1989). Keratinolytic activity is known in some species of *Chrysosporium* (Jain & Agrawal, 1980), but there has been no report of thermostable form of keratinolytic proteinase by the genus *Chrysosporium*.

2.3.1 Findings/Contribution to Knowledge and Discussion

In our study, *Chrysosporium keratinophilum* (which identification of pure isolate was confirmed by Professor D. Chabasse of the Centre Hospitalier Regional Et Universitaire D'Angers France) produced a thermostable alkaline-active, keratinolytic proteinase when grown in medium containing keratin as an exogenous inducer (Dozie et al., 1994b). When the fungus was grown in Sabouraud dextrose broth which lacked keratin, there was no enzyme activity. Keratinolytic proteinase activity was detected in lactose/keratin/mineral salt culture filtrate after 4 days growth of *C. keratinophilum*. The activity was maximum (80 U ml⁻¹, h⁻¹) after 10 days (Fig. 1). Gel-filtration of the crude enzyme showed a single protein peak corresponding with a single peak of keratinolytic proteinase activity. The enzyme recovery was 13% with 11-

fold purification

The enzyme was optimally active at pH 9.0 and highly stable (>90% residual activity) from pH 7 to 10 at 25°C for 24 hours (Fig. 2). The optimum temperature for enzyme activity was 90°C (Fig. 3). This compared with temperature optima of 40°C for the keratinolytic proteinase of *M. gypseum* and 43°C to 54°C for that of *Trichophyton mentagrophytes*. The proteinase had 100% activity retention after incubation at the assay temperature, 40°C for 1 hour, whereas the activity half-life at 90°C was 30 minutes. The enzyme would be potentially useful, therefore, for biotechnological applications, since a large number of processes are carried out at elevated temperatures.

2.4 Practical utility of keratinophilic fungi

Keratinophilic fungi are reported to degrade keratin by means of proteolytic enzymes called keratinases. This property can be of ecological interest in the possible use of these fungi in the hydrolysis of keratin waste in the environment. Our study showed that the keratinase hydrolyzed only keratin proteins (feather, hair) as non-keratin substrates such as casein, BSA or gelatin were not degraded (Dozie, 1991). Other studies have shown that alkaline proteolytic keratinases are of importance in the leather tanning industries where they are used to remove hair from hides (Chaplin & Bucke, 1990) in preference to traditional methods involving sodium sulphide. Furthermore, Dalev (1990) has reported the enzymic hydrolysis of feather keratin to obtain protein concentrate for fodder for animals. Therefore, the use of keratinases in the degradation of various keratin wastes in our environment and the enzymic bioconversion of vast quantities of keratin derived from poultry production to protein fodder are possible and yet to be commercially exploited in the much touted waste to

wealth conversion strategy.

2.5 Future Research Priority

Additional studies therefore, should be conducted by microbiologists, biochemists, and biotechnologists on the use of keratinophilic fungi in production of protein fodder and in the degradation of keratin wastes in the environment. The potential public health impacts on the environment and for animal nutrition are enormous.

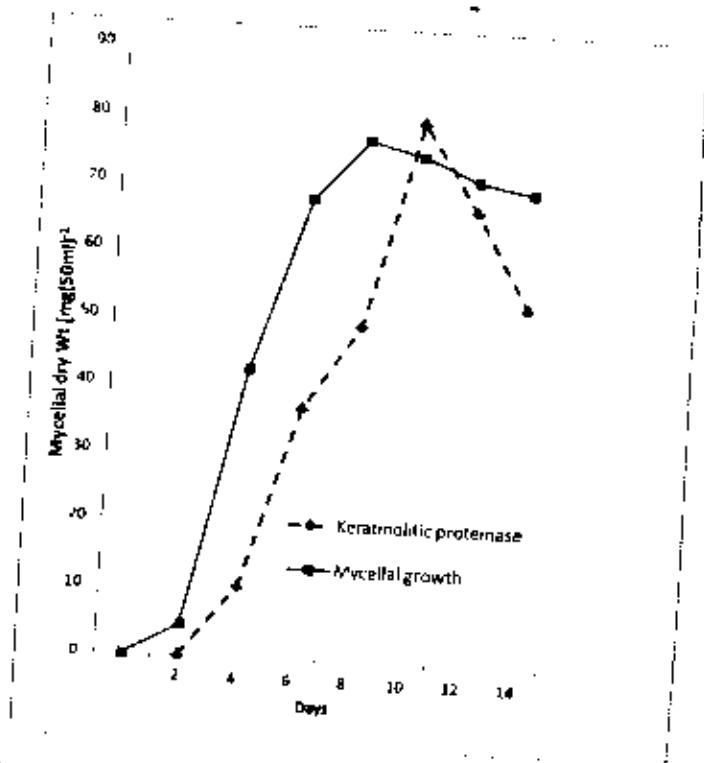


Fig. 1. Mycelial growth and keratinolytic activity of *Chrysosporium keratinophilum* cultured in lactose/keratin/mineral salts medium

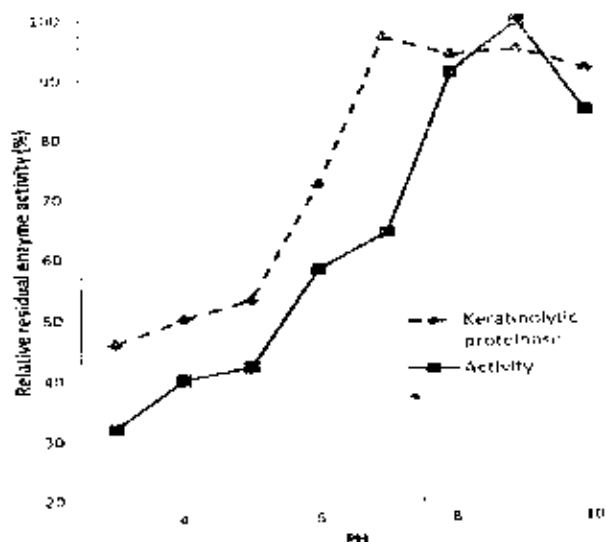


Fig. 2: Effect of pH on the activity and stability of keratinolytic proteinase from *Chrysosporium keratinophilum*

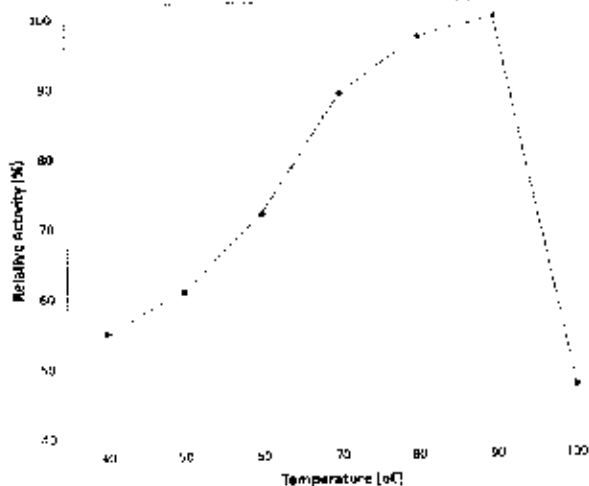


Fig. 3: Effect of temperature on the activity of keratinolytic proteinase from *Chrysosporium keratinophilum*

CHAPTER THREE

3.0 Onchocerciasis in the Imo River Basin of Nigeria.

Human onchocerciasis commonly called 'river blindness' is one of the most important chronic parasitic diseases afflicting millions of people in the tropical and sub-tropical zones. It is caused by a filarial nematode worm called *Onchocerca volvulus* which is transmitted by black flies of the genus *Simulium* (WHO, 1995). Onchocerciasis constitutes a major public health problem and obstacle to socioeconomic development in endemic communities where an estimated 17.7 million people are infected with about 270 000 blind and 500,000 severely visually impaired and over 6.5 million suffer from severe itching or dermatitis (WHO, 1995; Nwoke & Dozie, 1997; Nwoke et al. 2006). Nigeria is the most endemic country in the world and accounts for about 40% of global prevalence (WHO, 1995). The alternative name, "river blindness" draws attention to the most serious and irreversible complication of the disease, which is blindness.

3.1 Prevalence, Intensity and Distribution of Disease

Prior to our studies in the Imo River Basin (Figs. 4 & 5), Nwoke and Uwazie (1991) had only described the distribution of the immature stages of *Simulium damnosum* vector blackflies in Isiukwuato, Abia State. This was in addition to rapid assessment surveys to identify communities eligible for treatment with meclizan or ivermectin (Nwoke et al., 1994).

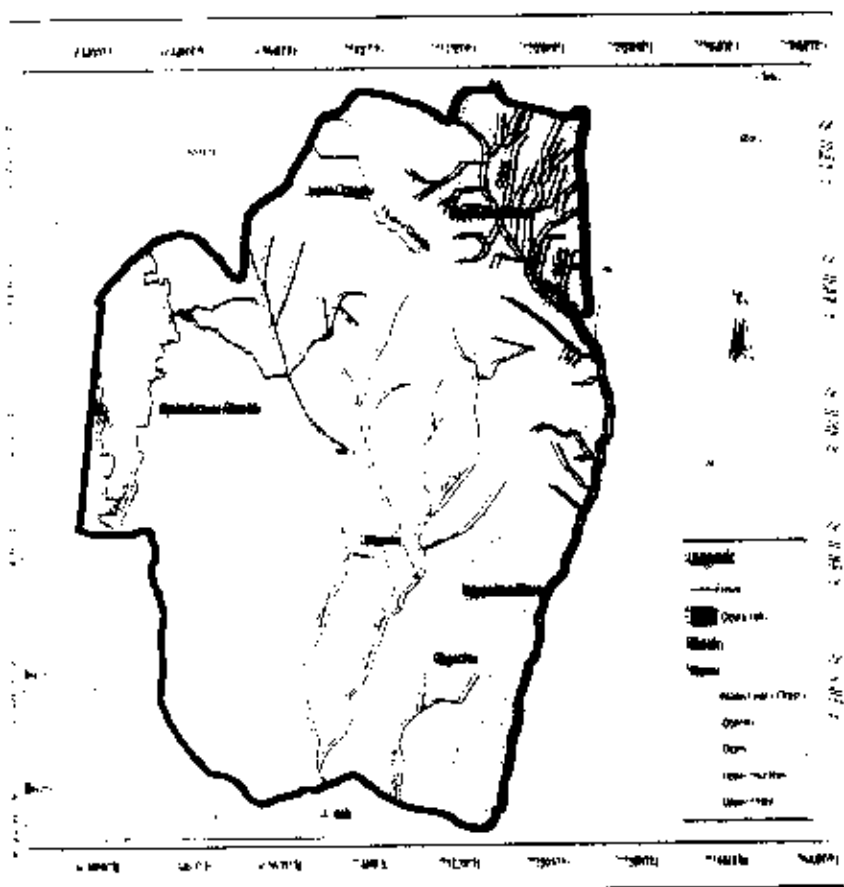


Fig. 4. Major Sub-river Basins In Imo State, Nigeria

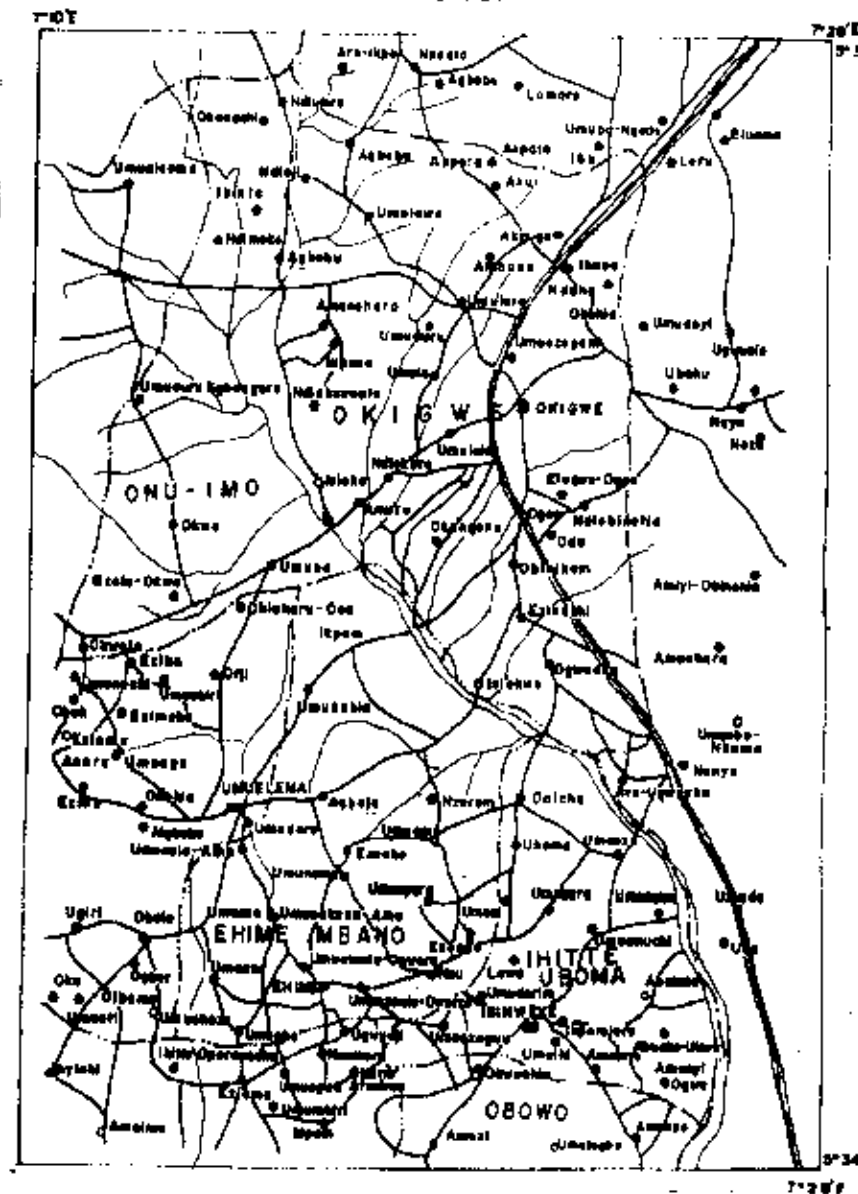


Fig. 5. Parts of the Imo River Basin, Imo State Nigeria

3.1.1 Findings/Contribution to Knowledge and Discussion

Our results confirmed endemicity of onchocerciasis within the Imo River Basin and showed that infection had wider distribution than was previously reported (Nwoke et al., 1994). The prevalence and intensity of infection varied ($P < 0.05$) amongst communities in the Upper Imo River basin with a mean higher score (26.8%) and community microfilarial load [CMFL] (22.1 mf/ss) respectively than communities in the Middle Imo River basin with prevalence of 19.0% and CMFL of 18.1 mf/ss (Table 2) (Dozie et al., 2004a; Dozie et al., 2006a). This variation was due to unequal exposure of villagers to the bites of the disease vector, *S. damnosum*, apparently because of marked differences in the hydrogeological and topographic features of the Basin. Several communities in the Upper Imo River Basin are characterized by rocky and hilly terrain, and presence of numerous rivulets and streams with exposed basement rocks which form resistant rapids that favour the breeding of the vectors (Plate 1). The communities in the Middle and Lower Basin are drained by bigger and sluggish streams.

Interestingly, the overall sex-related infection showed a similar pattern in males (22.9%) and females (22.1%) (Dozie, 2002). This was attributable to equal exposure to the vectors of the disease which occurred through involvement in the same occupational activities (in particular, farming) or by living in close proximity to the breeding sites of the vectors. To a lesser extent, the local dress code for women which exposes some parts of the body especially the head, hands and feet to the bites of the vectors might be contributory

Table 2 : Overall Prevalence and intensity of Onchocerciasis in the Imo River Basin

Study Area	No of Community sampled	Total No. examined	No. and (%) infected with <i>Onchocerca volvulus</i> microfilariae (mf)	No. and (%) uninfected with <i>O. volvulus</i> microfilariae	Community microfilariae density (mf/ml)
Upper Imo River basin	17	3311	889 (26.8)	2422 (73.2)	52.1
Middle Imo River Basin	21	4037	766 (19.0)	3271 (81.0)	18.1
Total	38	7348	1655 (22.5)	5693 (77.5)	20.1

Our findings contrasted with the pattern of sex-related infections in the savanna biocological zone, where males had significantly higher infection than females (Nwoke et al., 1991; Anosike & Onwuliri, 1995). In these cases, occupational exposure played a prominent role in determining degree of infection than living in close proximity to breeding sites of vectors. Furthermore, it is reported that the dress code of Muslim women gives enough protection against bites of the vectors (Anosike & Onwuliri 1995; Nwoke & Dozie, 1997; Dozie & Nwoke, 2002).

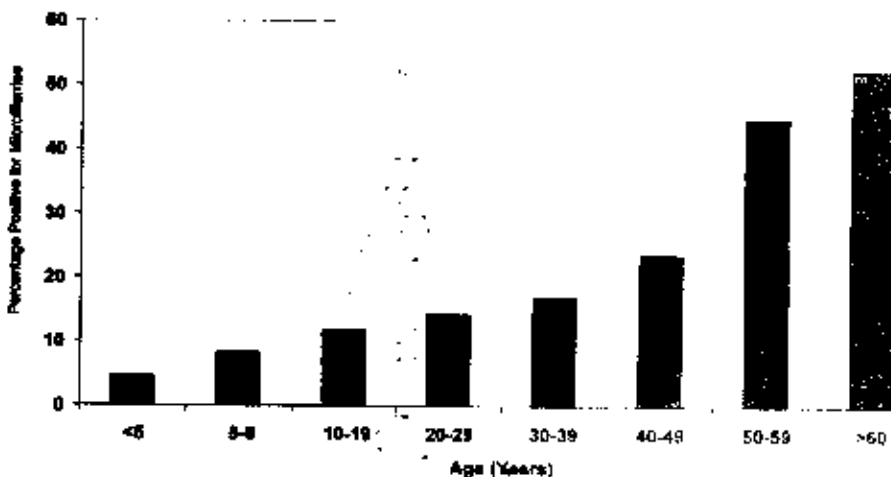


The age-related prevalence characterized by increase in infection with increasing age is consistent with previous reports on onchocerciasis, underscoring the chronic and cryptic nature of the disease (Onwuliri et al, 1987) (Fig. 6). Indeed, our studies showed that children below nine years of age were infected with microfilariae of *O. volvulus* (Dozie et al., 2004a; Dozie et al., 2006a). This was attributable to the habitual activities of these children around the streams including swimming, washing, fetching water, assisting with fishing and farming etc which exposed them to the vectors, thereby initiating early man/fly contact.

Occupation played a major role in acquisition of infection, as farmers, fishermen and hunters had higher infection than pupils/students, traders, civil servants, indoor/sedentary workers (Dozie, 2002; Dozie et al., 2004a; Dozie et al., 2006a). This finding is consistent with the infection pattern in the northern savanna where farmers among other man-water professions are highly infected as a result of their continuous exposure to the disease vectors (Nwoke et al., 1991; Onwuliri et al., 1987; Dozie and Nwoke, 2002).



Plate 1: Typical onchocerciasis vector infested stream in Umulolo in the Upper Imo River Basin



Overall Age-Specific Prevalence of Onchocerciasis in the river basin

3.2 Onchocercal pathology in the Imo River Basin of Nigeria

Various pathological complications of onchocerciasis including onchocercal skin disease, lymphatic complication and onchocercal ocular disease were found in our study. Onchocercal pathology is due mainly to inflammatory response to dead than living microfilariae.

3.2.1 Findings/Contribution to Knowledge and Discussion

a. Onchocercal skin disease (OSD)

Nodules (17.7%) and itching (15.2%) were the most common lesions encountered in our study while lichenified onchodermatitis (LOD) (1.9%) was the least common manifestations (Dozie, 2002; Dozie et al., 2004a; Dozie et al., 2005) (Table 3). A total of 1299 nodules were obtained with greater distribution around the lower extremities (iliac crest, greater trochanter of the femur, coccyx and sacrum) than other parts of the body, with few nodules found on the upper part particularly the trunk and head (Plate 2). Like previous studies that had established a positive correlation between anatomic location of nodules and distribution of microfilariae (Kalo, Ilari

1998), the location of nodules on the lower parts of the body corresponded with higher microfilarial density (Dozie, 2002). A similarity was reported in Guatemala and Mexico for head nodules which are associated with relatively high concentration of microfilariae in the head and neck region and a higher risk of ocular complications (Salazar, 1974).

About 15.2% of study participants reported itching which presentation varied from mild and intermittent or severe and continuous (Dozie et al., 2005). In our study, there was not much difficulty in identifying some endemic communities as a cross section of the population was busy scratching, underscoring the grave public health and socio-economic consequences of the onchocercal skin disease (OSD) (Amazigo, 1994).

Our study was the first to characterize OSD in the Imo River Basin based on earlier classification by Murdoch et al., (1997) into acute papular onchodermatitis (APOD), chronic papular onchodermatitis (CPOD), lichenified onchodermatitis (LOD), atrophy (ATR) and depigmentation (DPM) or leopard skin (LS) (Dozie, 2002; Dozie, et al., 2005). Generally, most of the OSD especially the reactive ones (APOD, CPOD and LOD) in addition to DPM were observed on the trunks, hands and legs of infected persons (Plates 3, 4, and 5).

The low prevalence of ATR (3.4%) in our study could be due to the investigation of this condition in people below 50 years, in order not to confuse ATR due to onchocerciasis with senile ATR. ATR is due to repeated episodes of acute inflammation associated with microfilarial death. It's striking feature made Laigret describe it as a condition that makes young people look old and old people look like lizards, which Hughes and Daly called "crocodile skin" (Hughes and Daly, 1951).

b. Lymphatic complications

Our study for the first time reported a preponderance of lymphatic complications associated with onchocerciasis (Dozie, 2002; Dozie et al., 2006b). Cases of lymphadenopathy (Plate 6), hanging groin (Plate 7) and lymphoedema (genitalia) or genital elephantiasis (Plate 8) were obtained in the Basin. Although, there is an overlap between *O. volvulus* and other filarial pathogens in the aetiology of lymphoedema (limb) or elephantiasis of the limb, most cases encountered in this study were in persons with *O. volvulus* positive biopsies (Plate 9).

c. Onchocercal ocular disease (OOD)

Onchocercal blindness is the most serious and perhaps feared clinical manifestation of onchocerciasis because of its irreversibility (Nwoke and Dozie, 1997). Various forms of OOD were reported in our study including itchy eye, impaired vision and blindness (Dozie et al., 2003) (Table 4). An overall blindness prevalence of 0.2% was obtained in our study which by any known epidemiological index is low (Plate 10). This is not surprising since the prevalence of OOD and blindness in West Africa has been reported to be lower in the rainforest than in the savanna zone (Nwoke and Dozie, 1997). The difference is due to the reported greater invasiveness and pathogenicity for the cornea of the eye by savanna strains of parasite than the forest strain (Duke, 1981).

In addition, climatic factors may play a role in this difference especially with the intense sunlight combined with the harmattan dust and dryness in the savanna which could influence/alter corneal metabolism, making it more susceptible to microbial invasion.

d. Signs and Symptoms of Non-classical Onchocerciasis

Besides the classical features of onchocerciasis, certain features of uncertain association, aetiology or pathogenesis

earlier described by WHO (1995) were obtained in the Basin. These include musculoskeletal pain [MSP] (17.6%), general debility (19.5%) and epilepsy (0.5%) (Dozie, 2002; 2004b). Previous studies had established an association between MSP and onchocerciasis (Pearson, 1988).

It is significant that our study established a causal association between onchocerciasis and epilepsy (Dozie, 2002; Dozie et al., 2006c; Kaiser et al., 2008). Thirty eight epileptics were identified in this study, out of which 17(44.7%) had microfilariae in addition to other manifestations of onchocerciasis. Kaiser et al., (1996) had established a significant association between epilepsy and onchocerciasis in Kabarole district, Western Uganda, in the absence of the only confounding variable, the parasitic cestode, *Taenia solium*.



Plate 2: Onchocercal Nodules on the Head and Waist Regions of a Male and Female respectively



Plate 3: Acute Papular Onchodermatitis (APOD) in a patient



Plate 4: Chronic Papular Onchodermatitis (CPOD) on the Trunk and Legs of a Female Patient

Table 3: Distribution of Onchocercal Skin Lesions in the Imo River

Basin

Study Area	Total no examined	No (%) infected	No (%) with onchocercal skin lesions							Total no (%) with Onchocercal lesions
			itching	Nodules	APOD	CPOD	LOD	ATR	DPM	
Upper Imo River	3311	889 (26.8)	574 (17.3)	675 (20.4)	273 (8.2)	349 (10.5)	73 (2.2)	104 (3.1)	357 (10.8)	2405 (72.6)
Basin										
Middle Imo River	4037	786 (19.0)	643 (13.5)	624 (15.5)	227 (5.6)	245 (6.1)	64 (1.6)	145 (3.6)	342 (8.5)	2190 (54.2)
Basin										
Total	7348	1656 (22.5)	1117 (15.2)	1299 (17.7)	500 (6.8)	594 (8.1)	137 (1.9)	249 (3.4)	699 (9.5)	4595 (62.5)

Key

APOD = Acute Papular Onchodermatitis

CPOD = Chronic Papular Onchodermatitis

LOD = Lichenified Onchodermatitis

ATR = Atrophy

DPM = Depigmentation





Plate 5: Depigmentation on the Legs and Hands of a Male and Female Patient



Plate 6: Bilateral Lymphadenopathy in a Male Patient



Plate 8: Lymphoedema of the Genitalia (Penile and Scrotal)
in male patients



Plate 9: Lymphoedema Limb in a female patient



Plate 10: Onchocercal Blindness (Bi-ocular) in a male patient



Plate 7: Onchocercal hanging groin in a male patient (Nwoke, 2011; 2017)

Table 4: Distribution of Onchocercal ocular disease in the Imo River Basin

Study Area	examined	No (%) infected	No (%) with signs and symptoms of ocular disease				Total (%) with Ocular Signs and symptoms
			Third eye	Impaired Vision	Blindness	Total (%) with Ocular	
Upper Imo River Basin	3311	889(26.8)	297 (9.0)	1009 (30.5)	6 (0.2)	1312 (39.6)	
Middle Imo River Basin	4037	766(19.0)	320 (7.9)	666 (16.5)	6 (0.1)	992 (24.6)	
Total	7348	1655(22.5)	617 (8.4)	1675 (22.8)	12 (0.2)	2304 (31.4)	

3.3 Socio-economic Consequences of Onchocerciasis in the Imo River Basin

3.3.1 Findings/Contribution to Knowledge and Discussion

a. Social costs

Our study showed that all the communities investigated had no specific local name for onchocerciasis as a disease entity. However, due to the marked clinical manifestations of onchocerciasis, most villagers recognized and had local names that reflected the physical conditions of their afflictions (Dozie et al., 2004c). For instance, onchocercal nodules was called "akpu" (i.e. boil that is hard and does not burst). The various forms of depigmentation were called "ukwu ocha" or "okpa ocha" meaning "white legs". All forms of lymphoedema of genitalia were called "ibi". Blindness irrespective of origin was referred to as "ishi" or "anya ishi" (Dozie, 2002).

Dermatitis, a feared clinical manifestation like blindness was called, "oko vari vari" and "oranmanu". "Oko vari vari" is a simple description of the sound produced by the nails during scratching of the affected skin while "oranmanu" signifies the use of oil to reduce occasional swelling that may result from unprovoked intense itching (Dozie et al., 2004c). The socioeconomic and cultural significance of dermatitis on skin beauty is further underscored by reference to this condition in women as "osuru nwanyi ahia di" or "osuru agboho ebu ahia", meaning skin conditions that cost a woman suitors, and "onyiri ncha", meaning skin condition that cannot be removed or cleared by use of soap (Amazigo, 1994). Generally, skin lesions of any origin was identified as a problem for girls because of the social significance of appearance and culturally acceptable standards of beauty and such girls were victims of discrimination at school and social gatherings (Dozie, 2002; Dozie et al., 2004c).

b. Economic costs

Our study showed that onchocercal skin disease (OSD) caused absenteeism amongst pupils where the head of household was infected. The mean percentage drop out in school attendance was higher in households where heads had severe-OSD (4.9%) when compared with households where heads were of non-OSD status (2.1%) (Dozie, 2002). The drop-out rate was attributed to a number of factors especially the participation of pupils in intra-household labour substitution as a means of making up-for the slack in income generation and in other household activities. Such labour substitution activities included helping out in the farms and in the market and in other economic activities.

A similarity is drawn from hyperendemic communities with high blindness rates in the Taraba River Valley of Nigeria where a child-guide is attached to every blind adult resulting into absenteeism from school (Akogun and Onwuliri, 1991). Such a child-guide withdraws from school if already enrolled and spends a substantial part of the pre-teenage years leading a blind member of the household (Plate 11). The direct and indirect impacts of onchocerciasis on school attendance might have long term detrimental consequences on the overall socioeconomic development of endemic rural communities in the Imo River Basin. The need therefore, for sustained control of onchocerciasis in endemic countries in Africa including the Imo River Basin of Nigeria becomes very imperative.

3.4 Treatment of Onchocerciasis and Implications for Disease Endemicity in the Imo River Basin of Nigeria

Treatment of onchocerciasis in endemic communities in Africa including the Imo River Basin is carried out by use of ivermectin or Mectizan under the Community-Directed Treatment with Ivermectin (CDTI) strategy of the African Programme for Onchocerciasis Control (APOC) (Nwoke & Dozie, 2001; Nwoke et al., 2006).

3.4.1 Findings/Contribution to Knowledge and Discussion

Our studies confirmed that majority of the communities in the Imo River Basin, especially the Upper Imo River Basin qualified for CDTI (Dozie et al., 2004a; Dozie et al., 2006a). The impact of treatment showed that over 20% of villagers in the study area namely; Amuro (16.6%), Aku (32.3%), Nzerem Ikpem (19.1%) and Awuchinimo (15%) reported disappearance/dissolution of onchocercal nodules following treatment with ivermectin (Table 5). Our studies further showed that the perceived cause for the disappearance of nodules was ivermectin (82.6%), while 4.4% respondents reported it was not ivermectin and 13% respondents were not sure of what caused the disappearance/dissolution (Table 6) (Ukaga et al., 2001). The respondents reported that their nodules which were initially hard became smaller and softer after the first dose of ivermectin and disappeared completely following subsequent doses. Later studies in some onchocerciasis endemic foci in south-eastern Nigeria confirmed disappearance/dissolution of nodules after repeated ivermectin treatment (Emukah et al., 2004; Anosike et al., 2007).

Other reported benefits of repeated ivermectin treatment included expulsion of intestinal worms (24.6%), improved vision (11.7%), reduced itching (18.5%), reduced rashes (17.3%), darkening of leopard skin (6.6%), increased appetite (22.3%), reversal of secondary amenorrhoea (4.5%), improved libido in men (6.6%), reduction in arthritic and other musculoskeletal pain (7.9%) and clearance of head lice (4.5%) (Anosike et al., 2007). It is notable that some of the subjects reported that ivermectin was not as effective as when they first took it, implying a reduction in efficacy of the drug due to resistance after repeated usage.



Plate 11: A child-guide leading a blind family member (Nwoke, 2017)

3.5 Future research priorities

The complete control and/or elimination of onchocerciasis in the Imo River Basin will depend on the following:

- a. The sustenance of the Community-directed Treatment with Ivermectin (CDTI) strategy which empowers endemic communities' ownership of the programme including participation in policy choice, development and implementation as well as monitoring and evaluation.
- b. The development of a safe macrofilaricide that is active against the adult worm to complement ivermectin which kills only the microfilariae.

Table 5 : Number of persons per study population in endemic communities with experience of dissolved/disappeared nodules

Study area	Total no of persons interviewed	No. of persons who experienced dissolution of nodules (%)
Amuro	108	18 (16.6)
Aku	93	30(32.30)
Nzerem Ikpen	63	12(19.10)
Awuchinimo	60	9(15.00)
Total	324	69(21.30)

Table 6 : Perceived causation for disappearance of nodules

Study area	Total no. of persons who experienced dissolution of nodules	Causation for nodule dissolution		
		Ivermectin (%)	Not ivermectin (%)	Not sure (%)
Amuro	18	18 (100.00)	0(0.00)	0(0.00)
Aku	30	21 (70.00)	3 (10.00)	6(20.00)
Nzerem Dkpe	12	9 (75.00)	0 (0.00)	3(25.00)
Awuchinimo	9	9 (100.00)	0 (0.00)	0(0.00)
Total	69	57 (82.61)	3 (4.35)	9 (13.04)

CHAPTER FOUR

4.0 Non-communicable Diseases – The bane of modernity
A non-communicable disease (NCD) is a medical condition or disease that is not caused by infectious agents (i.e. non-infectious or non-transmissible). NCDs are chronic conditions characterized by silent or insidious onset, and develop slowly for a long period of time and often without symptoms.

4.1 Prevalence of NCDs in Imo State, Nigeria

Non-communicable diseases are a growing public health concern in countries in sub-Saharan Africa (SSA) including Nigeria where not many empirical studies exist on the prevalence and distribution.

4.1.1 Findings/Contribution to Knowledge and Discussion

In our studies, we established the prevalence of common non-communicable diseases in Imo State Nigeria (Nwoke & Dozie, 2006). These include high blood pressure, diabetes, ulcer, cancer, obesity, arthritis, asthma, heart disorder, renal diseases and neurosis (Table 7). Other common NCDs in our environment include hypercholesterolemia and low back and neck pains. It is notable that non-communicable diseases are major contributors to the rising burden of diseases in terms of illness (disability) and death (Nwaokoro et al., 2014; Dozie, 2015).

Table 7 : Overall Prevalence of Non-Communicable Diseases in Selected Health facilities in Imo State, Nigeria.

PERIOD OF STUDY (JAN-DEC)	N0 (%) with Non-Communicable Disease												
2003 (N=108,258)	HB 1,084 (1.0)	DIABETES 637 (0.6)	ULCERS 76 (0.1)	CANCER 588 (0.5)	OBESITY 24 (0.002)	ARTRITIS 382 (0.4)	HEART DISORDER 294 (0.3)	RENAL DISEASES 66 (0.1)	ASTHMA 231 (0.2)	NEUROSIS 564 (0.5)	RTA 4,914 (4.5)	ENT 391 (0.4)	INFECTIONS 444 (0.4)
2004 (n = 114,622)	1,122 (1.0)	1,131 (1.0)	133 (0.1)	689 (0.6)	67 (0.1)	510 (0.4)	421 (0.4)	124 (0.1)	397 (0.3)	643 (0.6)	5,106 (4.5)	541 (0.5)	571 (0.5)
2005 (n = 115,161)	1,410 (1.2)	983 (0.9)	192 (0.2)	815 (0.7)	88 (0.1)	597 (0.5)	556 (0.5)	191 (0.2)	437 (0.4)	729 (0.6)	5,512 (4.8)	668 (0.6)	684 (0.6)
TOTAL =338,041	3,616 (1.1)	2751 (0.8)	401 (0.1)	2092 (0.6)	179 (0.05)	1489 (0.4)	1271 (0.4)	381 (0.1)	1065 (0.3)	1936 (0.6)	15,532 (4.6)	1600 (0.5)	1699 (0.5)

KEY:

- HB = High Blood Pressure (Hypertension)
- RTA = Road Traffic Accident
- ENT = Ear, Nose & Throat Infections
- URTI = Upper Respiratory Tract Infections.

NCDs are caused mainly by environmental influences (such as unhealthy diets, physical inactivity, high stress levels, tobacco use, excessive use of alcohol etc). They also may be due to genetic (i.e. inherited) factors. Due to the fact that they are often associated with particular lifestyle, they may be referred to as "lifestyle diseases".

One of the major reasons for their rising prevalence is the failure of public health to educate people about healthy lifestyles and overall wellness. The bad news about NCDs is that they have silent onset and develop and progress over a long time without symptoms. But the good news about NCDs is that you can detect many of them early, and if you do so, they can be managed. In order to control the rising prevalence of NCDs, public health scientists and indeed everyone must rise to the challenge of deploying public health education to promote and propagate healthy lifestyles and wellness activities.

The control of NCDs will depend mostly on knowledge of family history of diseases, lifestyle modification and the conscious application of the following namely: annual medical check including lifestyle check, moderate and regular exercise, eating healthy diet, moderate use of alcohol, stress management and meditation, avoiding smoking, care of the ear, nose, throat, teeth, eye, compliance with safety, getting adequate sleep (at least 7 to 8 hours per day for adults) etc (Dozie, 2015).

In conclusion, good health is key to all we do in life. Therefore,

the choices we make daily will go a long way to determine how healthy we remain and how well we age. There is no doubt that everyone wants to live to a ripe old age and achieve this gracefully too. This means that we must show discipline by the way we live, especially, the choices we make. For instance, food is necessary. We must eat and eat well too. An uncle once said that: "we must punish the body with food, before it begins to punish us with disease". I agree with this assertion but emphasize that we must eat healthy food and do so in strict moderation. Moderation of our food type and intake and overall lifestyle are the master keys outside prayer for healthy living, graceful ageing and productive livelihood.

Mr. Chairman, distinguished audience, I wish to conclude this lecture by sharing a reflection by the Spiritual Leader of Tibet, the 14th Dalai Lama, Tenzin Gyatso on his thoughts about man. When asked what surprised him most about humanity, he answered thus: *"Man. Because he sacrifices his health in order to make money. Then he sacrifices money to recuperate his health. And he is so anxious about the future that he does not enjoy the present; the result being that he does not live in the present or the future; he lives as if he is never going to die, and then dies having never really lived"*. This is food for thought for humanity including my humble self and those of us listening to this lecture.

CHAPTER FIVE

5.0 Future Research Activities

My future research focus will center mainly on the pathogenesis and management and possible elimination of some of the intractable communicable diseases of tropical prevalence and persistence, in particular HIV/AIDS, tuberculosis and malaria. Due to the rising prevalence of non-communicable diseases in our environment especially cancer, diabetes, obesity, high blood pressure, cardiovascular disorders etc, we will attempt to establish their relationships/influences on the communicable diseases.

Malaria in particular has remained a major public health problem despite years of concerted efforts and resources spent on its control. Currently, our studies on malaria have received massive boost because of the deep passion and great devotion of one my PhD students, a Fulbright Scholar, now a Senior Lecturer in the Department of Public Health, Dr. Uchechukwu Madukaku Chukwuocha. Very modest progress has been made in our studies on malaria in Nigeria especially in the Imo River Basin area. For instance, we have established the average transmission rate in the Basin (Chukwuocha and Dozie, 2011); described the burden of the disease in pregnant women (Chukwuocha, Dozie and Chukwuocha, 2012); established drug-resistant markers in South-eastern Nigeria (Chukwuocha et al, 2013); identified prevalent home management strategies for febrile conditions (Chukwuocha et al, 2014a); established impact of poverty on treatment-seeking behaviours (Chukwuocha et al, 2014b); defined changes in the hematological profiles of children with malaria treated with different ACTS (Chukwuocha et al, 2015) etc.

The impetus to find alternative treatment in the face of massive and sustained drug resistance with the currently used

antimalarials, especially the recently introduced artemisinin drugs, coupled with the absence of a protective malaria vaccine has led us to explore the potentials of whole plants (WPs) as alternatives to antimalarial pharmaceuticals. It is significant that our preliminary studies showed that WP *Cymbopogon citrates* (Lemon grass) delivered more effective antimalarial activity than pure chloroquine (formerly the gold standard for treatment of malaria) in murine malaria models (Chukwuocha et al. 2017).

We believe strongly that based on this result, whole plant (WP) may deliver more effective treatment because of the synergistic activities of the various chemical constituents that are conserved in the whole plant body. We are poised more than ever to continue to explore whole plant therapies for the treatment of malaria. This approach may hold the key to solving this age-long scourge. However, it is notable that in the event of development of a malaria vaccine, our most recent study shows high level of intent to comply with such a vaccine in South eastern Nigeria (Chukwuocha et al., 2018).

5.1 General Recommendations

Vice-Chancellor Sir, towards the pursuit and accomplishment of quality research for development in the Biological/Health/Life Sciences, I strongly recommend the establishment of a well-equipped laboratory for basic molecular biology studies and a viable animal house in the university. This will create the urgency to depart from studies that dwell mainly on prevalence of microorganisms and their diseases to understanding the molecular basis of microbial diversity and in particular, the pathogenic mechanisms of disease causation. Furthermore, this laboratory will give impetus to the rapid development of the new programme in Forensic Science domiciled in the School of Biological Sciences (SOBS).

Secondly, to reduce the ill-effects of the new 'sitting disease' occasioned by prolonged sitting in the conduct of daily activities. I strongly recommend a 5 - minute per hour break during work or meetings.

Thirdly, I recommend a 30 - 40 minute exercise at least 3 to 4 times a week for all staff irrespective of age.

Lastly, for all staff who are 40 years and above, I recommend strongly a personal policy of compulsory health check annually. This gives an idea of your health status aimed at early detection and management of the non-communicable disorders.

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I began my career as an Assistant Lecturer at the Imo State University Owerri on 23rd September, 1992. I thank Professor T.O.C. Ndubuizu, First Substantive Vice-Chancellor for approving my employment as pioneer staff [IMSU/REG/PF.SS/0022] of the then College of Medicine and Health Sciences. I appreciate other Vice-Chancellors of the Imo State University Owerri for supporting my career progression at different times. In a very special way, I thank the two Vice-Chancellors who in acting capacity facilitated my promotion to the Professorial cadre namely, Arc. Professor U.O. Nkwogu to the rank of Reader in October 2002 and Professor A.N. Okere to the rank of Professor in October, 2005. I appreciate Professor C.B. Jiburum, former Provost, College of Medicine and Health Sciences for his encouragement, support and motivation. Similarly, I appreciate my friends and colleagues at the Imo State University Owerri for their encouragement.

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I arrived the shores of the Federal University of Technology Owerri on November 26, 2006 for Sabbatical Leave. From then till now, it has been an exciting period, engaging in one activity or the other. I appreciate staff of the Office of the Vice-Chancellor (OVC) who worked with me as Coordinator and Executive Assistant to the Vice-Chancellor between November 2006 and June 2011; staff of the Department of Public Health when I served as Head of Department from July 1, 2011 and

June 30, 2012, staff of the School of Health Technology when I served as Dean from July 1, 2012 to June 30, 2017 for immeasurable support to me in those assignments.

I thank the staff of our great University (teaching and non-teaching) for immense goodwill, love and support to me as a person and especially in the discharge of various assignments. My election to the 11th Governing Council is a testimony.

My sincere gratitude goes to our amiable Vice-Chancellor, Professor Francis Chukwuemeka Eze, KSJl, JP, for granting approval to present this lecture. I congratulate him, once again, on his appointment as the 7th Substantive Vice-Chancellor of our great university. As we learn from Psalm 75:6, "promotion cometh neither from the East, nor from the West, nor from the South, but from God". I enjoin staff and students to give full support to the Vice-Chancellor in the implementation of his mission as envisioned in, "Driving the Culture of Excellence". Let us support him by doing our bit in our respective assignments and not by gossip. We must understand that gossip will impact negatively on his assignment as Vice-Chancellor by reducing his anointing, diminishing his exalted position and affecting his warm, cool-cucumber personality. I enjoin all of us to embrace the words of the Catholic Pontiff, Pope Francis who said, "Look after your work, doing it with enthusiasm, humility, competence, passion and with a spirit that knows how to thank God". I deeply appreciate the Vice-Chancellors and Principal Officers past and present of our great University for their encouragement to me.

My proper formation as a scientist and teacher came through the unceasing love, care and devotedness of two men of extraordinary goodwill who each took me as a son, brother, friend, colleague and confidant. They are Professor B.E.B Nwoke

FAS, one-time Acting Vice-Chancellor of the Imo State University Owerri and Professor C.O.E. Onwuliri, FAS of blessed memory, 5th Substantive Vice-Chancellor, of our great University. Both taught me a lot, including the fact that respect is earned through hard work and cordial relationship with colleagues; being fair but firm on students and most importantly for re-emphasizing what my parents earlier taught me, that prayer, humility, contentment and honesty are the current keys to growth and development in life. While Professor Onwuliri trained me as his nineteenth (19th) PhD student, Professor Nwoke serving as co-supervisor took me through the practical rudiments of field experience and proper conduct as a teacher. It is continually my prayer that God will continue to prosper the families and grant eternal rest to Professor Onwuliri. Amen

My sister, Professor (Mrs.) Viola Onwuliri, former Hon. Minister of State and Supervising Minister, Foreign Affairs and late Hon. Minister of State, Education deserves a special mention. She encouraged me to enroll at the University of Jos for my doctorate degree, which I achieved under her roof with the close supervision of her late darling husband and dear friend Professor C.O.E. Onwuliri FAS. I remain grateful for that piece of advice and for her constant encouragement.

My formation till now has continued under the unceasing prayers, love, support and advice of my Catholic priest friends and other Pastors of the Anglican Communion.

In a special way, I thank my in-laws, Sir Andrew Ajaero and Lady Patricia Obioma Ajaero for accepting me into their family through approval to marry their second daughter and third child, Dr. Chinonso Dozie. I appreciate deeply my brothers-in-law, Chef, Ukachukwu and Onyebuchi and sisters-in-law, Chetachi, Nkechi, Udogadi, Daisy and their families for being there for me at all times.



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and Executive Assistant to the 5th Substantive Vice-Chancellor, Professor C.O.E. Onwuliri of blessed memory. I reserve my last words of appreciation for the constant best factor in my life, God Almighty. I cannot thank Him enough for grace, mercies and favours, all unmerited. My beloved Bible verse, Romans 9:16 remains a daily assurance that "it is not of him that willeth, nor of him that runneth, but of God that showeth mercy". In the course of my work as an academic, I probably remain the greatest beneficiary of God's grace and mercy. This is especially when I recall that my father was taunted in 1992 for permitting me choose a teaching job; when I recall that I was threatened by my students as they became aware of my proposed appointment as Acting, Head of Department of Microbiology & Industrial Microbiology in 2004; when I recall the miraculous rescue from two flight incidents on my way to-and-fro Kenya and South Sudan on WHO/APOC REMO mission in 2004 with Professor B.E.B. Nwoke; when I recall that I traversed the whole of North Central and parts of North West and North East Nigeria in 2001 on REMO refinement exercise in about three (3) weeks with Professor B.E.B. Nwoke; when I recall the many intrigues of life including the University system that I have passed through etc., I can only but thank God unceasingly and continue to count my blessings and name them, one by one. I can only but ask God: "How can I repay the Lord for His goodness to me". I can only but sing aloud to the heavens. "To God be the Glory, Great Things He had Done".

Mr. Vice-Chancellor, distinguished ladies and gentlemen, my life in its entirety, particularly, this 26-year sojourn in the University is a story I praise God all day long. Indeed it is my story, my song, praising my savior all day long. Thank you for your patience and most kind attention.

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PAST INAUGURAL LECTURES

S/NO	LECTUREE	TOPIC	DATE
1.	Prof. C. O. G. Obah	"Communication in the service of a nation"	Dec. 17 1986
2.	Prof. F. O. I. Baijig	"Food Processing and Preservation, Paths to Self-Sufficiency"	Jan. 18 189
3.	Prof. V. O. Nwuke	"Where Rust Doth Corrupt"	Nov. 14, 1990
4.	Prof. S. C. O. Ugholue	"In the thrones of Polyne and Textiles"	Dec. 11, 1996
5.	Prof. O. O. Onyemobi	"Mineral Resources exploitation Processing And Utilization. A Sine Qua Non For Nigeria's Industrial Development"	Jul. 17, 2002
6.	Prof. A. B. I. Udenfchie	"In Search Of Food F.U.T.O And The Nutritional Challenge of Carnival Seeds"	Sept. 18, 2003
7.	Prof. E. O. N. Okoroafor	"Expendable Polystyrene Pattern Casting Process. A Revolution in Metal Casting"	Mar. 17, 2004
8.	Prof. P. B. U. Achi	"Acquisition of Indigenous Machinery Design Manufacturing The Engineering Education and Training Perspective".	June 28, 2004
9.	Prof. M. I. Nwifo	"Securing the Harvest to ensure Food for all. A Plant Pathologist's Perspective".	Jul. 28, 2004
10.	Prof. M. U. Horje	"The Chicken or the Egg. Nature and Nurture. New Genetic Spread Sheet and Gene Pool in the Breeding and Evolution of A New Nigerian Man".	Nov. 17, 2014
11.	Prof. J. O. U. zueghu	"Salvaging our Food from Fungi Rot to Ensure Food Security"	Oct. 29, 2008
12.	Prof. C. S. Nwadiaro	"Inland water Data Base As a Sine Qua Non for Fisheries Development in Nigeria".	May 7, 2009
13.	Prof. M. C. Ofob	"Food Security and Mitigation of Climate Change Through Ecosystem Based Agriculture".	May 27, 2009
14.	Prof. R. O. Esonu	"Unconventional Feed Resources for Livestock Development and Food Security. Paradigms for Nigeria Livestock Industrial"	Jun. 24, 2009
15.	Prof. E. O. P. Akpan	"Project Management: A Catalyst for Rapid Industrial Development in Emerging Economies".	Oct. 10, 2009
16.	Prof. C. C. Asiabaka	"Scaling-up Agricultural technologies for Food Security and Poverty Reduction Whose Knowledge Counts: The Farmer. Febor The Scientist?"	15, 2010
17.	Prof. C. H. Ovwinnin	"Foundation Engineering in a Difficult Environment".	June 10, 2010
18.	Prof. N. N. Onu	"Training in Geophysics. The Challenges of Oil Exploration. Gully Erosion and Water Resources".	Mar. 16, 2011
19.	Prof. Mrs. H. C. Nwigwe	"Aquatic Resources Management. A Tool for Food Security in Nigeria".	Mar. 16, 2011
20.	Prof. C. N. U. Ibaonu	"Enhancing Acceptability and Economic Value of Local Foods Through Product Development and Promotion".	April 27, 2011
21.	Prof. G. C. Ehduru	"Towards a Unified World View. The "god particle" and the Traditional Christian Belief".	Oct. 4, 2012
22.	Engr. Prof. F. Anyanwu	"New Energy Technology Revolution: A Catalyst in Sustainable National Development".	Oct. 29, 2012

23.	Prof. Goddy Nkem Onuoha	"The Chemical Pathway Small Change that made a Difference"	Mar. 27, 2013
24.	Prof. C. C. Eze	"Agricultural Finance: A Panacea for Agricultural and Rural Development"	Mar. 26, 2014
25.	Prof. A. N. Amadi	"Environmental Health: The Dynamics, Application, Implications and way forward in Nigeria's Healthcare Delivery System"	July 23, 2014
26.	Prof. G. E. Okunribido	"Depopulating the Unemployed Mass in Nigeria Through Effective Project Delivery"	Sept. 10, 2014
27.	Prof. A. A. Awik	"The Question of the Election: It's Origin and Impact on Chemical Process"	Mar. 10, 2016
28.	Prof. E. U. Onyeaka	"Food Security: Concerns and Comforts in Food Processing"	April 27, 2016
29.	Prof. J. S. Orebiyi	Agricultural Credit: A Policy Catalyst needed for Poverty Reduction and Agricultural Transformation in Nigeria.	Sept. 22, 2016
30.	Prof. Bede Chinyere Anusimwan	"Liquid Meals: Searching for Properties at Elevated Temperatures"	Oct. 19, 2016
31.	Prof. U. U. Egeonu	Analytical Assessment of Atmospheric Residual Aerosol in the Environment"	Mar. 29, 2017
32.	Prof. N. J. Okiedo	Human Food And Healthy Lives Contrasting Insufficient Production And Preservation of Good Quality Meat And Egg April 26, 2017	
33.	Engr. Prof. S. N. Avorgwa	Leveraging Food Security Challenges in Nigeria: Through Agricultural Production, Processing and Storage or Mitigating Economic Recession	Oct. 24, 2018