

# UNIVERSITY OF ILORIN



THE ONE HUNDRED AND SIXTY-THIRD (163<sup>RD</sup>)  
INAUGURAL LECTURE

**“KNOCKING DOWN THE BARRIERS  
TO FOUR O’CLOCK ACTIVITIES AND  
REPRODUCTIVE INADEQUACIES”**

*BY*

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**THURSDAY, 29<sup>TH</sup> SEPTEMBER, 2016**

This 163<sup>rd</sup> Inaugural Lecture was delivered under the  
Chairmanship of

The Vice-Chancellor  
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## **Courtesies**

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All other Academic Colleagues,  
Members of the Administrative and Technical Staff,  
My Lords, Spiritual and Temporal,  
Distinguished Students of Biochemistry,  
Members of my family, Nuclear and Extended,  
Gentlemen of the Print and Electronic Media,  
Esteemed Invited Guests, Friends and Relations,  
Great Students of the University of Ilorin (Greatest  
Unilorites),  
Distinguished Ladies and Gentlemen

### **1.0 Preamble**

I give adoration and praises to Almighty Allah, the most Beneficent, the most Merciful, the Giver of life, the Creator of all creatures, the Fountain of wisdom and the Lord of the universe, for not only sparing my life till

today, but also giving me the grace to present the 163<sup>rd</sup> Inaugural Lecture of the University of Ilorin, today, 29<sup>th</sup> September, 2016. The first inaugural lecture since the inception of the Department of Biochemistry in 1977, entitled “*The Essential Lipids: Life’s Springboard*” was presented by Professor Adewale Agboola Odutuga on 12<sup>th</sup> December, 1985, as the 20<sup>th</sup> in the University. The second (61<sup>st</sup>), “*Eat and Die by Little*” was delivered by Professor Musbau Adewumi Akanji on 24<sup>th</sup> October, 2002 while the third (78<sup>th</sup>), “*All for the Love of Nutrients*” was presented by Professor Hussein Oyelola Bukoye Oloyede on 26<sup>th</sup> May, 2005. The fourth from the Department (102<sup>nd</sup>) entitled “*The Little Giants in Food*” was delivered by Professor Adenike Temidayo Oladiji, on 22<sup>nd</sup> March, 2012 while the 5<sup>th</sup> (127<sup>th</sup>) entitled “*The Invisible Behind and Beyond the Visible*” was presented by Professor Sylvia Omonirume Malomo on 4<sup>th</sup> April, 2013. Furthermore, the 6<sup>th</sup> (146<sup>th</sup>) entitled “*Dreadable Unpaired Species: Biochemical Approach as Panacea*” was presented by Professor Elizabeth Adenike Balogun on 10<sup>th</sup> April, 2014. All these lectures have addressed Basic and Applied Biochemistry that include Lipid, Nutrition, Toxicology, Food Biochemistry, Membrane Biochemistry and Enzymology.

Today, I feel highly honoured and privileged to be allowed to deliver this 163<sup>rd</sup> Inaugural Lecture of our great University, University of Ilorin with the title: **“KNOCKING DOWN THE BARRIERS TO FOUR O’CLOCK ACTIVITIES AND REPRODUCTIVE INADEQUACIES”**. It is the 2<sup>nd</sup> from the newly created Faculty of Life Sciences and the 7<sup>th</sup> from the Department of Biochemistry, coming barely six months after my appointment as Professor of Biochemistry.

## 2.0 Introduction

**Biochemistry** emerged as a distinct subject during the first decade of the 19<sup>th</sup> Century when scientists combined Chemistry, Physiology and Biology to investigate the chemistry of living systems. This was subsequently named “**Physiological Chemistry**”. The dawn of Physiological Chemistry (now known as Biochemistry) was credited to Anselm Payen, who in 1833, discovered the first enzyme, diastase, that is now referred to as amylase (Hunter, 2000). Biochemistry focuses heavily on how the structures of biomolecules (proteins, lipids, carbohydrates, nucleic acids, vitamins, enzymes, hormones etc) relate to their functions, how processes operate within the cells at the molecular level and how cells communicate with each other.

Biochemistry may be viewed as the application of Chemistry to the study of biological processes at the cellular and molecular levels.

Although, Biochemistry is a laboratory-based science that brings together Biology and Chemistry, Biochemists (people that study the chemical and physical principles of living organisms) are not 2-in-1 individuals that specialise in the teaching of Biology and Chemistry as separate subjects.

***Biochemistry has consequently become the basis for the understanding of all biological processes. It provides explanations for the causes and management of many diseases in humans, animals and plants***

The science of Biochemistry has enjoyed development so much so that today, there are various distinct subject areas that have been established (Akanji, 2002). Some of these distinct interconnected areas are **Reproductive**

**Biochemistry and Biochemical Toxicology** where I have devoted my energy and research for the past 17 years since joining University of Ilorin as an Assistant Lecturer in 1999.

## **2.1 Reproductive Biochemistry and Biochemical Toxicology**

Mr. Vice-Chancellor, Sir, Distinguished Ladies and Gentlemen, unlike the other Professors in the Department whose choice of Biochemistry as a career was either premeditated or originated from their interests, mine was not. Right from my days at St. Anthony's Secondary School, Ilorin, I had always craved to read Medicine and specialise in Gynaecology and Obstetrics simply because people will always get married and the resulting pregnancy(ies) will require some kind of medical management (antenatal care), but as faith will have it, things did not work as planned. I was offered admission by University of Ilorin to read Biochemistry in 1987 when I graduated from secondary school. Since it was out of my proposed career, I opted for Kwara State College of Technology (now, Kwara State Polytechnic), Ilorin for my "A" levels in Physics, Chemistry and Biology thinking it will brighten my chances. Lo and behold, the following year (1988), I was again offered admission to read Biochemistry. It was at this time that I gave in to destiny. Today, I am pleased to inform you all that I am a true alumnus of University of Ilorin, having completed my B.Sc., M.Sc. and Ph.D. programmes in the Department of Biochemistry, under the supervision of my academic father and mentor, Prof. Musbau Adewumi Akanji. Prof. (Mrs.) Adenike Temidayo Oladiji joined later to co-supervise my doctoral thesis.



Mr. Vice-Chancellor, Sir, with all these events, I still remain committed to the course of Reproductive Health. My venture into the areas of **Reproductive Biochemistry and Biochemical Toxicology** was by design. When I was looking for what to research on for my Ph.D., I met one Mr. Lawan, a Hausa herbseller, at a mechanic workshop in 2003, who approached me with a **‘sugar cane-like stick whose shape resembles that of the penis’** and raised it up and down. Since I could not communicate with him in Hausa language, I asked my mechanic who told me that he was mimicking the erection of the male copulatory organ, the penis, meaning that the plant could be used in solving problems associated with the organ. Later in the day, at a café, while I was waiting for the internet to respond, I peeped into my neighbour’s cubicle and was amazed to see two individuals browsing a phonographic site. With all these, I decided to seek guidance from the Qur’an and was at peace with myself when I discovered the following verses of the Qur’an in support of **sex and reproduction**:

*“Your wives are a tilth for you, so go into your tilth when you like, and do good beforehand for yourselves, and be careful (of your duty) to Allah, and know that you will meet Him, and give good news to the believers.....” Qur’an 2:223*

*“It is made lawful to you to go into your wives on the night of the fast; .....” Qur’an 2:187*

*“And Allah created you of dust, then of the life-germ, then He made you pairs;...” Qur’an 35:11*

Mr. Vice-Chancellor, Sir, little did I know that, one day, I will be addressing a distinguished audience like this

on issues relating to sexuality and reproduction. The totality of these and the concern on how men with more than one wife and the old ones have been coping sexually spurred me into the screening of the plant that was introduced to me at my mechanic's workshop, for aphrodisiac (sex enhancing) activity and safety. This formed the basis of my Ph.D. research, which I successfully completed in 2006 and hence my continued passion for research on options that are easily available with reduced adverse effects that will **KNOCK DOWN THE BARRIERS TO FOUR O'CLOCK ACTIVITIES AND REPRODUCTIVE INADEQUACIES.**

**Reproductive Biochemistry** is the application of Chemistry to the study of biological processes of reproduction at the cellular and molecular levels. These biological processes include gametogenesis (formation of gametes), fertilization, embryo development, pregnancy, sexual differentiation (process by which the male and female sexual organs develop), and mechanisms by which the reproductive organs develop, differentiate, age and incur disease. Research in Reproductive Biochemistry has broad applications in Public Health, Medicine (including Veterinary Medicine), Agriculture and Animal Science.

**Biochemical Toxicology** is however, the scientific study of adverse effects of chemical compounds/agents on living organisms. These substances may produce toxic effects such as disturbance in growth patterns, discomfort, disease, organ dysfunction and even death.

Mr. Vice-Chancellor, Sir, distinguished Ladies and Gentlemen, all organisms including man **should reproduce to generate new ones** as directed by Allah in Qur'an 35:11 as well as in Genesis 9:7 ("**And you, be fruitful and multiply, teem on the earth and multiply**

in it”). However, along the process of producing offsprings (children or young of a particular parent), one of the stages might be hampered with making it difficult to undertake **satisfactory four O’clock activities** (morning sex) that will result in **reproduction** (multiplication). It is in this interesting area of **knocking down the barriers by seeking complementary and alternative means to the orthodox approaches** that I wish to address you today.

### **3.0. Four O’ Clock Activity**

Four O’clock activity denotes early morning sex or early morning penile-vaginal intercourse. Although, legitimate sex can be performed at any time of the day, the best time to have sexual intercourse is **not in the dark night hours but early in the morning** between 3am to 5am which typically is 4am, hence the term, **Four O’ Clock Activity** (Herbenick, 2009).

*According to the sex therapist Geraldine Myers, “during this period, testosterone levels are highest in men and women. The elevated levels of testosterone is a prerequisite for love making, couples are horniest first thing in the morning and are most likely to reach orgasm at this period,”*

<https://www.vanguardngr.com/2016/05/best-time-enjoy-love-making/>

Having an erection on waking up is as good a reason as to initiate a morning sex. About 75% of men wake up feeling aroused. It is a good way of saying ‘good morning’ to each other (Herbenick, 2009).

Sex is the most powerful creative force given to man. It is a gift from Allah to give us the greatest pleasure, to create a deep companionship with one’s spouse and to

procreate. However, it must be used within the bounds of marriage as ordained by our Creator in the Qur'an as follows:

*“And go not nigh to fornication; surely it is an indecency and an evil way.....” Qur’an 17:32*

*“As for the fornicatress and the fornicator, flog each of them, (giving), a hundred stripes, and not pity for them detain you in the matter of obedience to Allah.....” Qur’an 24:2*

Having sex first thing in the morning and a minimum of **THREE to FOUR** times **A WEEK** is not only good for love life, but also beneficial health-wise. The benefits of sex include:

- Lowering of blood pressure, reducing the risk of heart attack by releasing oestrogen in women and protecting against heart diseases and prostate cancer (Ebrahim *et al.*, 2002);
- Boosting of the immune system by stimulating the body's first line of defense, immunoglobulin A, against cold and fever (Charnetski and Brennan 2004);
- Regulating menstruation by influencing the levels of lutenizing hormones that controls menstrual period in women and promoting better sleep;
- Releasing the feel-good chemical, oxytocin, that enhances closeness with ones partner and makes people happier for a longer period of time; and
- Reducing weight (lovemaking of about 20 minutes reduces 150 calories) (Brody, 2006).

*See how couples have been saving each other's life and imagine what is lost when couples CANNOT engage in regular, satisfactory sex within the context of marriage.*

*Sex is the greatest invention of all time; not has sexual reproduction facilitated the evolution of higher life forms, it has had a profound influence on human history, culture and society.*

Any marriage in which the man cannot enjoy sexual intercourse or satisfy his wife in bed and vice-versa is a dead marriage. If either of them, especially the man, is not satisfied, he may begin to pick up unnecessary quarrels with his wife but unwilling to talk about it in public. Short-wave, one-word communication will replace what is supposed to be sweet, hot love. He may then begin to engage in extra-marital affairs which may eventually result in prostitution, divorce and suicide as captioned by the following in the Vanguard Newspaper:

- **(A) My husband can't perform well, does not last a minute in bed, wife tells court:** “My husband does not satisfy me, he does not last a minute in bed” She said. “My husband has low sperm count. I bought the drugs prescribed by the doctor for him, but he refused to use them” “His refusal to take the drugs had resulted in fighting because I need a child. We have been married for nine years without issue”. Says Mrs Ifeanyi Samuel, 33 years old, a business woman on 10<sup>th</sup> June, 2015 at an Igando Customary Court in Lagos.

The husband, Samuel, 40 years old, a business man accepted that he had low sperm count and that he believed God for a miracle” “I am trying my best to satisfy my wife and I am also trusting God for miracle”[www.vanguard.com/2015/06/my-husband-cant-perform-well-does-not-last-a-minute-on-bed-wife-tells-court/](http://www.vanguard.com/2015/06/my-husband-cant-perform-well-does-not-last-a-minute-on-bed-wife-tells-court/)

- **(B) Husband sends wife packing after 10 years of childless marriage:** Adeola Alice, a Lagos housewife has pleaded with Alimosho Customary Court, Iyana-Ipaja, Lagos State on March 11, 2016 to dissolve her 10-year old childless marriage. Adeola, 46, claimed that **“My husband, Toyin (not my own, any way!) threw out my belongings because I do not have a child for him”**. Toyin threw out her property on February 12, 2013 and warned her never to come back. “He said anytime he sees me in his house, that day would be my last day on earth”.  
[www.naijagists.com/husband-sends-wife-parking-after-10-years-of-childless-marriage/](http://www.naijagists.com/husband-sends-wife-parking-after-10-years-of-childless-marriage/)

*May your marriage never end up in Igando or Alimosho Customary Court because 97% of issues are caused by bedroom inadequacies or inability of wife to conceive*

Mr Vice Chancellor, Sir, you will agree with me that there is the urgent need to **knock down these barriers to four O'clock activities and reproductive inadequacies** as they constitute societal problems too. However, in order to properly understand my contributions at **knocking down the barriers to four O'clock activities and reproductive inadequacies**, the following need to be understood.

### **3.1. Sexual Function and Sexual Response Cycle**

Sexual function is how the body reacts to the different stages of the sexual response cycle. The components of sexual function include libido/sexual desire (biological need for sexual activity pleasure), erection/genital congestion (firm, enlarged state of the penis, clitoris and nipple), ejaculation/lubrication (expulsion of semen/wetting of vagina), orgasm (climax (apex) of sexual excitement) and detumescence/resolution (return of the erect organ to flaccid state). The human sexual response cycle which is the sequence of physical and emotional changes that occur as a person becomes sexually aroused and participates in sexually stimulating activities include four distinct phases of excitement, plateau, orgasm, and resolution.

### **4.0. Reproduction and Reproductive Systems**

Reproduction is the process of generating new organisms. It can be **asexual** which does not require the participation of gametes and **sexual** which involves the fusion of the male gamete [sperm cells] and the female gamete [ova or egg cell] to form zygote. The different organs that play a role in reproduction constitute the reproductive system. The male reproductive system consists of the main male sex organs, the penis, scrotum and the testes (located outside around the pelvic region) and a series of ducts (epididymis, ductus deferens, ejaculatory duct and urethra) and glands (seminal vesicles, prostate gland, and bulbourethral glands). The male reproductive organs (i) produce, maintain, and transport sperm, (male reproductive cells) and protective fluid (semen); (ii) discharge sperm within the female reproductive tract during sexual intercourse; and (iii)

produce and secrete male sex hormones responsible for maintaining the male reproductive system and the development of sexual characters. The female reproductive system consists of the vagina, the uterus and the ovaries. The female reproductive organs (i) produce the eggs; (ii) receive the sperm from the male copulatory organ during sexual intercourse; (iii) allow the development of the zygote after fertilization; (iv) produce female sex hormones (oestrogen and progesterone); and (v) permit passage of foetus during birth.

*“The reproductive system makes life possible. An individual does not need the system to survive, but the human race does”*  
– CHR (2001)

#### **4.1. The Process of Sexual Reproduction in Humans**

**Human reproduction** is any form of sexual reproduction that consists of four distinct stages. These include (i) **sexual intercourse** (reproductive act in which semen is expelled into the female via male ejaculation with the aid of the penis); (ii). **conception/fertilization** (fusion of sperm with the egg and its attachment to the walls of the uterus); (iii). **pregnancy/gestation/gravidity** (state of carrying a developing embryo or foetus within the female body); and (iv). **parturition/giving birth/delivery** (forceful expulsion of the foetus from the uterus of the mother after the gestation period).



## 5.0. Sexual and Reproductive Dysfunctions-The Barriers being Knocked Down

### 5.1. Sexual Dysfunction and Reproductive Dysfunctions

Sexual dysfunction refers to any problem that prevents individuals or couples from wanting or enjoying sexual intercourse. Although, it occurs in both men (male sexual dysfunction, MSD) and women (female sexual dysfunction, FSD), it is a topic that many people are hesitant or embarrassed to discuss. It interferes negatively with a full sexual response cycle and takes a heavy psychological toll, bringing on depression, anxiety, and debilitating feelings of inadequacy.

A man has a sexual problem if he:

- ejaculates before he or his partner desires (one-minute man), does not ejaculate, or experiences delayed ejaculation (**ejaculation disorder**),
- is unable to have an erection of the penis sufficient for pleasurable intercourse (**erectile dysfunction**)
- is unable to reach the climax of sexual excitement or its complete absence during sexual intercourse (**orgasmic disorder**)
- lacks or loses sexual desire (**disorder of desire**)
- has prolonged (usually greater than 4 hours duration) and extremely painful erection unaccompanied by sexual desire (**priapism**)

A woman has a sexual problem if she:

- lacks or loses sexual desire (**desire disorder**)
- has difficulty reaching the climax of sexual excitement (**orgasmic disorder**)
- feels pain during sexual intercourse probably as a result of inadequate lubrication or involuntary

contraction of vaginal or other muscles during sex  
(**vaginismus or dyspareunia**)

- is unable to be aroused (**arousal disorder**).

Generally, sexual dysfunction in both males and females can be caused by a myriad of factors that are not limited to chronic medical conditions (diabetes, spinal cord injury), testosterone deficiency, pharmacological agents (antihypertensives, psychotropics, antidepressants), psychogenic, organic cause (increased penile sensitivity), surgery, systemic diseases (liver disease, renal failure), performance anxiety, hormonal changes, traumatic employment or marriage-related issues. Although, the worldwide prevalence of sexual dysfunction is put at 20-30% in men and 40-45% in women worldwide (Ramlachan and Campbell, 2014), the occurrence of sexual dysfunction is still very high as depicted in Tables 1 and 2.

Similarly, reproductive dysfunction is any disturbance in the normal functioning of a reproductive organ. Whenever there is reproductive dysfunction, the male and female reproductive system will not be able to perform their individual and collective roles that culminate into combining egg and sperm for the development of new life. The worldwide prevalence of reproductive dysfunction ranges from 5-50% in women and 15.8 – 29.6% in men (De Souza and Metzger, 1991). Various types of reproductive dysfunctions exist in men and women, but the ones investigated and reported in this lecture include infertility, reproductive organ dysfunction and polycystic ovarian syndrome. All these will be addressed later in “**My Research Efforts**”.

**Table 1: Prevalence of Male Sexual Dysfunction in some Countries**

Country	Sample Size	Age Range (Years)	Prevalence (%)
Nigeria	275	18-60	40.40
	984	35-70	57.50
China	1516	18-60	51.00
Egypt	600	30-70	63.50
Ghana	255	19-66	66.00
Morrocco	655	25-85	53.60
United Kingdom	109	16-65	32.00
USA	1290	40-70	33.00
Iran	2440	20-70	19.00

**Adapted From:** Amidu *et al* (2010a, b); Oyekanmi *et al* (2012)

**Table 2: Prevalence of Female Sexual Dysfunction in some Countries**

Country	Sample Size	Age Range (Years)	Prevalence (%)
Nigeria	242	21-55	63.00
	400	15-50	53.30
Ghana	301	18-60	72.80
Egypt	1000	16-49	69.00
Morrocco	728	20-80	26.60
China	3162	18-60	53.00
India	149	17.75	73.20
Iran	1456	15-70	52.00

**Adapted From:** Goshtasebi *et al* (2009); Nwagha *et al* (2014)

*By every standard and using the cut-off of 26.55% proposed by Weigel et al (2005), sexual dysfunction in both male (40.40-57.50%) and female (53.30-63.00%) is quite high in Nigeria despite the various orthodox management options. Therefore, the need to explore complementary and alternative*

*approaches using indigenous medicinal plants, considered to be readily available with minimal side effects.*

## **5.2. Management Options for Sexual and Reproductive Dysfunctions**

Current therapeutic approaches available for sexual and reproductive dysfunctions in both men and women can be categorised into traditional (phytotherapy-use of medicinal plants; zootherapy-use of animals and occultism) and non-traditional options or orthodox practice (pharmacological, non-pharmacological, surgical and non-surgical).

**5.2.1. Pharmacological Agents:** Pharmacological agents used to manage both sexual and reproductive dysfunctions include: (i) papaverine and prostaglandin for erectile difficulties; (ii) viagra, for erectile dysfunction and female sexual arousal dysfunction; (iii) clomipramine and fluoxetine for premature ejaculation; (iv) Vaginal lubricants, moisturizers and oestrogen therapies to decrease dyspareunia (Long *et al.*, 2006); and (v) Vitamin E and hormone-antioxidant combination to counter oxidative stress that is associated with sperm DNA damage and reduced sperm count and motility. **Side effects of these drugs include headache, vision changes, hypotension, bleeding, vaginitis (inflammation of the vagina), multiple pregnancy, gestational diabetes, Ovarian Hyperstimulation Syndrome (swollen and painful ovaries).**

## **5.2.2. Non-Pharmacological Approaches**

### **5.2.2.1. Psychological and Behavioural Counseling:**

This addresses the feelings of anxiety, depression, relationship problems that have impacted negatively on sexual function. Disorders of libido/desire, psychogenic erectile dysfunction, premature ejaculation, female arousal disorders can be managed by psychological/behavioural counselling.

**5.2.2.2. Lifestyle Changes:** This involves improving eating habits, exercising regularly, (for Poly Cystic Ovarian Syndrome, PCOS), abstaining from smoking, curbing alcohol intake, avoiding stress, discontinuing some medications, improving the frequency and timing of intercourse and regular exercising

## **5.2.3. Surgical Approaches**

These include:

**5.2.3.1. Penile Implants:** surgical insertion of artificial objects (prosthetic device) into the penis to bring about erection of the organ. It is used to manage failure of detumescence.

**5.2.3.2. *In vitro* fertilisation (IVF):** surgical insertion of fertilized egg into the uterus. It is used for people with oligospermia (low sperm count), PCOS, and endometriosis.

**5.2.3.3. Intracytoplasmic sperm injection (ICSI):** This involves injecting a single sperm cell directly into the egg and transferring the fertilized egg into the uterus of the female. **Risks associated with these approaches include infections, ovarian hyper stimulatory syndrome, multiple and ectopic pregnancies, increased risk of**

**miscarriage, embryopathy (abnormal embryo development) and transmission of genetic defects.**

#### **5.2.4. Non Surgical Therapy**

**5.2.4.1. Hormone Therapy/Androgen Replacement Therapy:** This involves the intramuscular injection of long-acting testosterone esters. Anti-androgens that decrease testosterone action can be used to manage PCOS.

**5.2.4.2. Penile Injection Therapy:** This involves the injection of Caverject™ or Edex™ (Alprostadil) into the side of the penis to produce erection.

**5.2.4.3. Vacuum Devices:** This entails placing a plastic cylinder over the penis to create a partial vacuum that bring about erection.

**5.2.4.4. Intrauterine insemination (IUI):** This is the placing of sperm cells directly into the uterus via a catheter. IUI is often used for people with low sperm count and reduced sperm motility, retrograde ejaculation, immunologic infertility and other causes of infertility.

**Side effects of non surgical therapy include hirsutism, acne, pain from the drugs, priapism (persistent or abnormally prolonged erection that lasts 4 hours or more), scarring or bleeding, numbness and pulling of scrotal tissues into the cylinder, visual disturbances and ovarian hyperstimulation syndrome.**

*While a number of potential therapeutic options are available to date, not one of the pharmacological treatment regimens has been yet considered the*

*“Gold standard” in the management of symptoms of Sexual and Reproductive Dysfunction in males and females (Uckert et al., 2006)*

### **5.2.5. Herbal Medicine as Complementary and Alternative Remedy for Inadequate Four O' Clock Activities and Reproductive Inadequacies**

Herbal medicine, also called phytomedicine refers to the use of plant parts (seeds, berries, roots, leaves, barks, flowers) or the entire plant for medicinal purposes. Plants due to its truly amazing healing properties, have been a revolutionary breakthrough in the management of sexual dysfunction and reproductive inadequacies and have become known world-wide as 'instant' treatment (Adimoelja, 2000) as corroborated in the following:

*Despite the increasing availability of effective conventional medical treatments, plant-derived and herbal remedies continue to provide a popular alternative for men and women seeking to improve their sex life (Rowland and Tai, 2003).*

Herbal medicine is a form of complementary and alternative medicine and currently almost one-fourth of the pharmaceutical drugs are derived from plants. In comparison to modern sophisticated artificial chemical medicine, there is currently a growing interest in medicinal plants because of their unique advantages over orthodox medicine. These advantages include being safer, acceptable, affordable, culturally compatible and suitable for chronic diseases. It is also used in treating certain diseases where conventional medicine have failed. Medicinal plants also have economic benefit (source of income through exportation). Many herbal plants including those for **knocking down the barriers to four O' clock activities and reproductive inadequacies** have been successfully extracted, purified, standardised and their chemical components/bioactive agents characterised (Adimoelja, 2000).

## 6.0. My Research Efforts

### 6.1. On Aphrodisiacs

#### 6.1.1. Male Aphrodisiacs

Mr Vice-Chancellor, Sir, an aphrodisiac (named after the Greek goddess, Aphrodite) is any food, drink or substance that arouses or increases sexual response or desire, potency or effectiveness of erection and sexual pleasure. The rising prevalence of sexual dysfunction in both males and females coupled with the serious side effects of the orthodox management options has necessitated our research on indigenous plants, which could provide relief, restore self-esteem and enhance quality of life of individuals. Some of these are considered as follows:

#### i. *Fadogia agrestis*

My research on herbal aphrodisiacs started with the administration of aqueous extract of *Fadogia agrestis* {known as Black aphrodisiac (English), *Baakin gagai* (Hausa)} stem to male rats. We (Yakubu, Akanji, and Oladiji, 2005) reported that the plant extract contained alkaloids (3.2mg/ml), saponins (20.8mg/ml), anthraquinones (0.9mg/ml) and flavonoids (0.9mg/ml). The extract significantly



*Fadogia agrestis* stem

and progressively increased male sexual behaviour parameters of **mount frequency** (the number of mounts



without intromission from the time of introduction of the female until ejaculation), **intromission frequency** (the number of intromissions from the time of introduction of the female until ejaculation) and significantly prolonged the **ejaculatory latency** (time lag between the first intromission and ejaculation). The extract also reduced the **mount latency** (time interval between the introduction of the female to the first mount by the male) and **intromission latency** (time lag from the introduction of the female to the first intromission by the male). There was also dose dependent increase in serum **testosterone** concentration. Yakubu *et al* (2005) concluded that the increase in the testosterone concentration may partly account for its mechanism of action as aphrodisiac. We (Yakubu *et al.*, 2005) also recommended that the water extract may be used to enhance **libido or sexual desire, penile erection, prolong early release of sperm by man** and change the nomenclature from **one-minute man to a “real man” who will last long enough on bed. The findings can also be adopted in Veterinary Medicine and/or Agriculture for the purpose of animal breeding/production that will consequently improve the economy of the breeder.**

Immediately this paper was published in Asian Journal of Andrology in 2005, the Chief Executive Officer of Superhuman Radio, based in Louisville, Kentucky, USA, Carl Lanore, interviewed me on our findings in March, 2006. This heralded the unlimited requests for me to become an exporter of *Fadogia agrestis* by some companies based in the US and Canada (Tai Brown from HerbAsia Corp. Company, Vancouver, Washington, USA and Dirk Tanis of Applied Nutraceuticals, Meeker Avenue,

Biose, USA). **This is an example of economic benefit of research on medicinal plants.**

Our findings on the safety/toxicity of the extract revealed that the various indices relating to liver and kidney function as well as some haematological (blood) parameters were altered in a manner that suggests some adverse effect; **the good news, is that there was full recovery of the animals from the assault of the extract when treatment was discontinued for a week** (Yakubu *et al.*, 2006; 2007a; 2008a).

Mr Vice-Chancellor, Sir, permit me to state here that the publication on the aphrodisiac activity of *Fadogia agrestis* stem opened up ways for me. I received from two research grants (F/3977-1 and F/3977-2) from International Foundation of Science (IFS), Stockholm, Sweden, to carry out research on **Identification and Characterization of Male Erectant and Aphrodisiac Active Principle(s) in Aqueous Extract of *Massularia acuminata* Stem and its Toxicological Evaluation in Rats** in 2005 and 2007, respectively. Furthermore, I secured a Postdoctoral Fellowship at University of Fort Hare, South Africa, in 2008 under the supervision of Prof. Anthony Jide Afolayan. In South Africa, I revolutionised the Department of Botany and made Animal Experiment the order of the day.

**ii. *Bulbine natalensis***

Mr Vice-Chancellor, Sir, permit me to briefly present my research findings in South Africa, notwithstanding that *Bulbine natalensis*, commonly known as *ibhucu* (Zulu), *rooiwortel* (Afrikaans), is not indigenous to Nigeria but South Africa. We (Yakubu and Afolayan, 2009a) discovered that the aqueous extract of the plant

exhibited prosexual behaviour in male rats as evident from the stimulatory effects on both the physical and biochemical indices of male sexual activity. **We concluded that aqueous extract of *Bulbine natalensis* stem may be used in the management of disorders of desire / libido (loss of sexual interest), premature ejaculation (one-minute man) and erectile dysfunction (inability to achieve and sustain an erection of the penis) in males.** These findings were presented at the 11<sup>th</sup> Annual Conference of Indigenous Plant Use Forum (IPUF) held at Hoer Volksskool, Graaff-Reinet, South Africa, between 7-10<sup>th</sup> July, 2008 where I earned the accolade “**Dr. MSD**” and afterwards became a



*Bulbine natalensis*

“Consultant” on reproductive health issues.

**Furthermore, Yakubu and Afolayan (2009b) also found out that the aqueous extract of *Bulbine natalensis* stem enhanced the success rate of mating and fertility. Apart from using this plant as a ‘kick starter’ (sexual invigorator) in males, it can also be used to boost sperm count and other semen profile. Findings also revealed that the extract is safe for use by pregnant female since the fetal and maternal outcomes were not significantly altered. However, other toxicity studies on *Bulbine natalensis* revealed that it adversely affected the:**

- a. white blood cells and those relating to it whereas it spared the red blood cells and those associated with it (Yakubu and Afolayan, 2009c); and
- b. normal functioning of the liver and kidney (Afolayan and Yakubu, 2009a). But interestingly, the dose (50 mg/kg

body weight) that produced the beneficial effects on both the male and female animals did not show adverse effect on most of the parameters and as such may not be of serious toxicological concern.

### iii. *Carpolobia lutea*

Mr. Vice-Chancellor, Sir, after screening for the effects of our indigenous plants for aphrodisiac activity in rats, we stepped up our study by providing scientific evidence for the use of this plant in animals with sexual disorder. We induced sexual dysfunction in male rats using paroxetine hydrochloride and then evaluated the ameliorative effects of *Carpolobia lutea* (known as

cattle stick (English), *Oshunshun* (Yoruba- Western Nigeria) and *Agba* or *Angalagala* (Igbo-Eastern Nigeria). **Yakubu and Jimoh (2014) concluded that the aqueous extract of *C. lutea* root restored various components of sexual arousal (feel sexy/horny) and performance or sexual prowess (penile erection, ejaculation and sexual stamina) as well as the reproductive hormones in the sexually sluggish male rats with the highest dose (141 mg/kg body weight) being the most effective. The findings**



*Carpolobia lutea*

provided experimental evidence in support of the folkloric claim of the plant in the management of sexual inadequacies in males. The plant can therefore be used for men that:

- i. cannot kick start the process of climbing their wives and are hesitant about it giving all manners of excuses to their wives (disorder of libido/desire);
- ii. their ‘thing’ is always looking down even when with their wives (erectile dysfunction);
- iii. do not last more than a minute in bed (one-minute man; premature ejaculation); and
- iv. cannot effectively and satisfactorily engage their wives in ‘bed fight’.

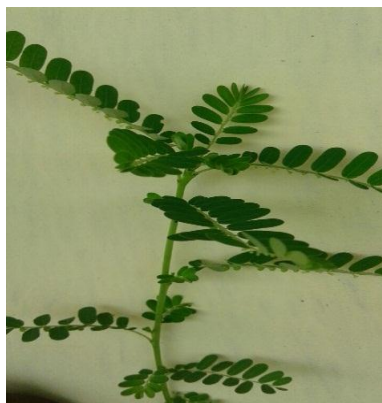
Mr. Vice-Chancellor, Sir, I do not want to be taken up by the women folk since all I have been reporting are centred on my findings on male sexual dysfunction. Therefore, I wish to also report here that indigenous medicinal plants had also been screened for their potentials as female aphrodisiacs.

### **6.1.2. Female Aphrodisiacs**

#### **i. *Phyllanthus amarus***

*Phyllanthus amarus* (Euphorbiaceae), also known as *eyin olobe* (Yoruba), *geeron tsutsaayee* (Hausa) and *Ngwu ite kwowa nasu* (Igbo) is an indigenous plant with acclaimed use of managing sexual disorders in females, among others. Nurudeen and Yakubu (2016) reported that the aqueous extract of *P. amarus* leaves contained secondary metabolites like alkaloids, flavonoids, saponins, steroids, anthraquinones, tannins and terpenes.

**Nurudeen and Yakubu (2016) also revealed that the leaf extract restored sexual competence in fluoxetine-induced sexually impaired female rats possibly by elevating the levels of reproductive hormones or improving consumatory behaviour especially higher lordosis frequency and interval. The sexual stimulant activity could be due to the presence of alkaloids, saponins and/or flavonoids among others which might be acting centrally or peripherally or both. The study thus gave scientific support to**



*Phyllanthus amarus*

the popular, acclaimed use of *Phyllanthus amarus* in the management of sexual inadequacies in females.

Furthermore, HPLC analysis revealed that Quercetin (8.34 mg/g), a flavonoid detected in the plant, which hitherto has been implicated to increase blood flow and thus aid sexual performance in the animals (Townsend and Emala, 2013) might as well be responsible for the aphrodisiac activity in the sexually impaired female rats.

## **ii. *Anthonotha macrophylla***

*Anthonotha macrophylla*, also known as *Abara* (Yoruba, Western Nigeria), African rosewood (English), is found growing in Guinea, Central African Republic, Congo, Gabon and Nigeria.

Yakubu and Olutoye (2016) validated the acclaimed use of the leaf extract as a female aphrodisiac as it enhanced the proceptive, receptive and orientational components of female sexual behaviour in rats. The prosexual activity was attributed to elevated oestrogen levels. **The plant can be used by females who have difficulty in initiating,**



*A. macrophylla*

**maintaining and escalating sexual interaction (sexual desire which include sexual urges, fantasies and wishes), sexual arousal and orgasm or climax which is the peak of sexual pleasure.** Other indigenous plants that have been scientifically investigated for their aphrodisiac activity are summarized in Table 3.

**Table 3: Indigenous Medicinal Plants with Scientifically Validated Aphrodisiac Activity**

<b>Plant Names</b>	<b>Part used</b>	<b>Results/Evidence</b>	<b>Conclusion</b>	<b>Reference</b>
<i>Massularia acuminata</i> , <i>pako ijebu</i> or <i>orin Ijebu</i> (Yoruba-Western Nigeria)	Aqueous root and stem extracts	Enhances pro-sexual activity via increased testosterone in rats. Higher doses (250-1000 mg/kg body weight) are not safe for consumption as oral remedy	Male sexual enhancing activity due to the alkaloids, saponins, and /or flavonoids since they have engorgement, androgenic and antioxidant Activities	Yakubu <i>et al</i> (2011a); Yakubu and Akanji (2011); Yakubu and Omoniwa (2012); Yakubu <i>et al</i> (2012a); Yakubu and Omoniwa (2014)
<i>Cnestis ferruginea</i> Vahl ex DC (Connaraceae), <i>Gboyin gboyin</i> or <i>Omu aja</i> (Yoruba), <i>Fura amarya</i> (Hausa) and <i>Amu nkita</i> (Igbo)	Aqueous root extract	Restores sexual competence in sexually impaired/sluggish male rats. Toxicity exhibited by the most effective dose was similar to that of the reference herbal drug (Powmax) used in	Provided scientific evidence in support of the acclaimed use as a male aphrodisiac	Yakubu and Nurudeen (2012; 2014)



		the study.		
<i>Lecaniodiscus cupanioides</i> , <i>aaka or akika</i> (Yoruba), <i>kaafinnamaa-zaaki</i> (Hausa), and <i>okpu</i> (Igbo)	Aqueous root extract	Enhances sex drive via changes in hormone levels. Restored the levels of nitric oxide and cyclic guanosine monophosphate in penile tissues of rats	Male aphrodisiac; could be explored for managing erectile dysfunction and disorder of libido in males	Ajiboye, Nurudeen and Yakubu (2014a); Nurudeen, Ajiboye, Yakubu, Oweh and Nosarime (2015).

Finally on our studies on aphrodisiacs:

1. Yakubu *et al* (2007b) published a review article on “**Male Sexual Dysfunction and Methods used in Assessing Medicinal Plants with Aphrodisiac Potentials**” in Pharmacognosy Reviews, India, wherein we emphasized on various methods that can be used to screen medicinal plants with aphrodisiac potentials as well as physical and biochemical indices that can be used to verify the acclaimed aphrodisiac potentials of medicinal plants and or chemical compounds.

2. Afolayan and Yakubu (2009b) published another review article entitled: “**Erectile Dysfunction Management Options in Nigeria**” in Journal of Sexual Medicine, a Journal of the International Society for Sexual Medicine, USA. The review focused on the orthodox and traditional approaches (phytotherapy, zootherapy and occultism) used in the management of erectile dysfunction in Nigeria.

3. Kayode and Yakubu (2016) on *Parquetina nigrescens*, African Parquetina (English), *Ewe ogbo* (Yoruba), *Kwakwanin* (Hausa) and *Mbgidim gbe* (Ibo), proposed the mechanism of action of aqueous extract of *Parquetina nigrescens* (AEPN) leaves as a sexual invigorator (**kick starter**) in male rats (Figure 1).

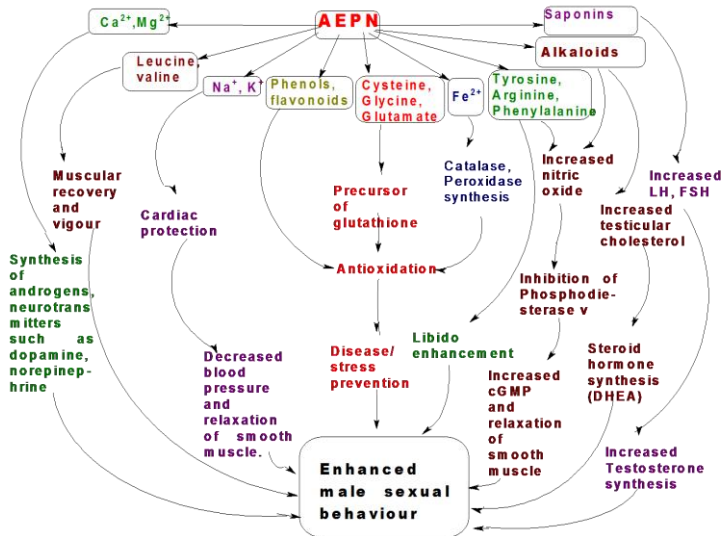


Figure 1: Proposed mechanism of action of aqueous extract of *Parquetina nigrescens* leaves (AEPN) as an aphrodisiac in male rats

**Source: Kayode and Yakubu (2016)**

The study concluded that AEPN restored both the physical and biochemical indices of male sexual activity/competence via changes in reproductive hormone, nitric oxide and phosphodiesterase V activity and attributed the pro-sexual effects to a myriad of mineral elements (calcium, magnesium, sodium, potassium and iron), amino acids (leucine, valine, cysteine, glycine, glutamate, tyrosine, arginine and phenylalanine) and secondary metabolites (phenolics, flavonoids, saponins and alkaloids) in the plant. The plant can alleviate erectile dysfunction, premature ejaculation and loss of sex drive in males.

## 6.2. On Infertility

Infertility is the inability to become pregnant after half a year (6 months) to a year (12 months) of unprotected sexual intercourse or inability to carry pregnancy to full term or absence of healthy sperm that can fertilize an egg. Male infertility refers to the inability of a male to produce a pregnancy in a fertile female due to deficiencies in the quality of semen and transport of sperm while female infertility is when a woman is unable to conceive or carry pregnancy to full term due to hormonal imbalance, obstructed fallopian tubes and immunological factors. It affects 13-15% of couples worldwide, 50-80 million Africans and 30.3% Nigerians (Kamel, 2010) with 60% or over of gynaecologic clinic consultations being infertility related. Although, men are responsible for 50% of the cases, women bear the sole blame that lowers their social status. The issue of fertility is captured in the following:

*The messenger of Allah, may the peace and benedictions of Allah be upon him also said: "Marry the one who is fertile, for I will boast of your great number" (Hadith No. 3229, Book of Marriage, Sunan An-Nasa'I, Volume 4)*

*Be fruitful and multiply, and fill the earth, and subdue it; and rule over the fish of the sea and over the birds of the sky and over every living thing that moves on the earth (Genesis 1:28)*

Mr. Vice-Chancellor, Sir, one other important area of **Reproductive Inadequacy**, which we have **knocked down** with our **indigenous medicinal plants** is Infertility.

## 6.2.1 Infertility in Males

### i. *Chasmanthera dependens* root

*Chasmanthera dependens* (Hochst), commonly called *Chasmanthera* is also known as *Atoo* (Yoruba) and *Ogbo* (Igbo). It is widely distributed in Sierra Leone, Eritrea, Somalia and Nigeria. My doctoral student and I discovered that the extract of *Chasmanthera dependens* root ameliorated

sodium arsenite-treatment related decreases in the semen volume, sperm count, sperm viability, sperm motility, rate of fast sperm progression as well as increased slow sperm progression and morphological defects (head defect, neck defects, and tail defect) of male



*C. dependens* plant



*C. dependens* root

Wistar rats. The extract also increased the female fertility indices (number of pups at birth, weight of pups at birth, sex, post-natal and post-lactation). We concluded that aqueous extract of *Chasmanthera dependens* root did not only restore the normal functioning of the testes but enhanced fertility in the male rats. **The extract can therefore be explored in the management of individuals suffering from low sperm count (oligospermia), the most common abnormal sperm quantity. It can also be used to enhance both the quantity and quality of the sperm and thus alleviate male infertility that is prevalent in our society.**

## ii. *Aspilia africana*

*Aspilia africana* commonly known as wild sunflower (English), *yunyun* (Yoruba, Western Nigeria), *kalankuwa* (Hausa, Northern Nigeria) and *oranjila* (Igbo, Eastern Nigeria), is widely distributed across tropical Africa. My postgraduate students and I investigated the effects of aqueous extract of *Aspilia africana* leaves on cadmium chloride-induced testicular perturbations in male Wistar rats and found out that the extract reversed and resorted the cadmium-mediated disturbances in the spermatogenic indices, biochemical parameters and histology of the rat testes as well as the normal secretory and synthetic functioning of the organ. Consequently, the plant can be explored in the management of infertility in males arising from low sperm count.

## 6.2.2. On Infertility in Females

### 6.2.2.1 Polycystic Ovarian Syndrome

Mr Vice-Chancellor, Sir, I am quite aware that it is not an easy task knocking down female infertility of several etiologies. My postgraduate students and I have therefore concentrated on **Polycystic Ovarian Syndrome** (PCOS). PCOS is the imbalance in the level of oestrogen and progesterone in females that leads to growth of ovarian cysts. It affects 4-10% of females of reproductive age (21-45 years) and causes irregular menstrual cycle, infertility, diabetes and breast cancer (Teede *et al.*, 2010).

### i. Model for Induction of Polycystic Ovarian Syndrome (PCOS)

Although there exist several reports that have recommended the use of mifepristone for the induction of PCOS in rodents, there are some shortcomings.

Information on the appropriate dose of mifepristone that will produce biochemical and clinical features of PCOS that are analogous to those in humans is almost non-existent. Yakubu *et al* (2015a) found that subcutaneous administration of 10 mg of mifepristone (RU486) on a daily basis for 9 days in Wistar rats gave a better model for inducing PCOS in animals that produced a more comprehensive reproductive, endocrine, and metabolic features of PCOS that are analogous to that of humans.

ii. *Cnestis ferruginea*

Yakubu and Ibiyo (2013) investigated the efficacy of *Cnestis ferruginea* root, locally called *Akara oje* or *Bonyin bonyin* (Yoruba, Southwest Nigeria), *Fura amarya* or *Otito* (Hausa, Northern Nigeria) and *Okpu nkita* or *Amunkita* (Igbo, Southeast Nigeria) at **knocking down** the menace of PCOS. We found out that the irregular and lengthened estrous cycle, absence of follicles in the ovarian stroma, elevated serum testosterone and reduced serum progesterone, luteinizing hormone and follicle stimulating hormone were reversed and/or attenuated by the extract treatment in a manner similar to the reference drug, metformin. The study concluded that the extract treatment reversed the hyperandrogenemia and attenuated the irregular estrous cycle in PCOS-induced rats. The saponins and flavonoids among others present in the plant were considered to be responsible for the clinical benefits of *Cnestis ferruginea* roots in the management of PCOS. Arising from this, the plant can be used to **knock down polycystic ovarian syndrome related infertility in females**.

### 6.3. On Anabolic and Androgenic Studies

Mr. Vice-Chancellor, Sir, several plant extracts and their active constituents have been reported to enhance reproductive processes, which are under the control of the androgens, notably testosterone, whereas some others act to antagonise the process by adversely affecting the hormonal, testicular and spermatogenic functions (Yakubu, 2012). Our research group investigated the anabolic and androgenic activities of our indigenously claimed aphrodisiac plants with respect to functioning of the testes which is dependent on the availability of androgen. These plants include:

- i. *Fadogia agrestis* stem (Yakubu *et al.*, 2008b)
- ii. *Massularia acuminata* stem (Yakubu *et al.*, 2008c)
- iii. *Bulbine natalensis* stem (Yakubu and Afolayan, 2010)
- iv. *Musa paradisiaca* root (Yakubu *et al.*, 2013)
- v. *Carpolobia lutea* roots (Yakubu and Jimoh, 2015)
- vi. *Parquetina nigrescens* (Kayode and Yakubu, 2016)

All these plants possessed anabolic and androgenic activities which enhanced sexual behaviour and stimulated spermatogenesis. Consequently, **the plants can knock down the barriers to four O' clock activities and reproductive inadequacies most especially those associated with with disorder of libido, erectile dysfunction, premature ejaculation and infertility.**

### 6.4. On Uterine and Ovarian Functions

The ovary and uterus are very important in the overall reproduction of the female. The ovary produces the female reproductive cells, the ova, for fertilization and reproductive hormones, oestrogen and progesterone, whereas the uterus nurtures the fertilized ovum that



develops into the foetus and maintains it till the baby is mature for delivery. We also screened indigenous plants for their effects on the ovary and uterus of animals. The totality of the biochemical and histological data in the study indicated that the aqueous extract of *C. populnea* [food gum (English), ogbolo (Yoruba - Western Nigeria) and dafaaraa (Hausa - Northern Nigeria)] stem promoted the normal functioning of the ovary and uterus and consequently enhanced the reproductive capacity of the female rats and maintained the health of the female reproductive system (Yakubu *et al.*, 2014a).

### **6.5. On Abortifacient**

To a lay man, an **abortifacient** is any substance that induces abortion. Specifically, an abortifacient is any agent that causes death of the zygote, embryo, or foetus after conception has occurred. Mr Vice-Chancellor, Sir, our aim of screening indigenous plants for their abortifacient activity is not to encourage abortion, but to provide alternative and complementary option to the orthodox abortifacient drugs and to surgery, which are not without their serious shortcomings. Furthermore, we hope through our studies on herbal abortifacients, to protect pregnant women from serious or life-threatening illnesses and genetic diseases that could be passed onto their children with devastating consequences. The screening of herbal abortifacients is to create the opportunity of having a database of medicinal plants with abortifacient properties so that pregnant women will not consume such plants if pregnancy is desired. In the light of these, my research team investigated the abortifacient activity of the following indigenous plants:

**i. *Bambusa vulgaris* and *Senna or Cassia alata***

*Bambusa vulgaris*, known as bamboo (English), and by other tribes in Nigeria as *Oparun* (Yoruba), *Iko* (Bini) and *Atosi* (Igbo) and *Senna or Cassia alata* Linn. Roxb [known as Craw-craw plant or Ringworm plant (English), *asunwon oyinbo* (Yoruba-Western Nigeria), *nelkhi* (Igbo-Eastern Nigeria)] were investigated for abortifacient activity in pregnant Dutch rabbits and Wistar rats respectively. Yakubu and Bukoye (2009) reported that the *Bambusa vulgaris* extract caused abortion, provoked vaginal opening and decreased female reproductive hormones. The abortifacient properties of the *Senna alata* extract were similar to the animals treated with the reference drug, mifepristone (Yakubu *et al.*, 2010a). The mechanism of abortion of the extracts was proposed to be through changes in the implantation site, altered hormone levels and, partly, estrogenicity. Therefore, the extracts are not safe for consumption as oral remedy during pregnancy.

**ii. *Ananas comosus***

Mr Vice-Chancellor, Sir, it is not all the time that the acclaimed use ascribed to a plant is correct. The juice of unripe pineapple (*Ananas comosus*) claimed to have abortifacient property was investigated in rats. But to our surprise, despite containing some chemical compounds (tannins, cardenolides, dienolides, cardiac glycosides and flavonoids) that could cause abortion, the fruit juice increased the concentrations of oestrogen and progesterone in the pregnant rats and did not cause any abortion (Yakubu *et al.*, 2011b). The fruit juice rather supported the growth and development of the fetuses. This however contrasts the findings of Pakrashi and

Basak (1976) that *Ananas comosus* caused abortion in mice and attributed same to the presence of steroids, which incidentally was not detected in our pineapple sample.

## **7.0. Other Medicinal Plants-Based Researches**

### **7.1. On Antiandrogens**

An androgen antagonist (anti-androgen) is any compound that has the biological effect of blocking or suppressing the action of male sex hormones such as testosterone within the human body (Grant and Ramasamy, 2012). Androgen-related diseases impair the well-being of many aging men. Unfortunately, the medications used to treat these diseases have many side effects. For example, finasteride, a synthesized 5  $\alpha$ -reductase inhibitor, can cause gynecomastia or man's 'boobs' (enlargement of a man's breasts, usually due to hormonal imbalance or hormone therapy) and severe myopathy (neuromuscular disorders in which the primary symptom is muscle weakness due to dysfunction of muscle fiber, like muscle cramp and muscular dystrophies) because of its structural similarities to the steroidal hormones (Grant and Ramasamy, 2012). The presence of anti-androgenic phytochemicals in plants, herbs, and foodstuffs provide an alternative to modern synthetic pharmaceuticals. Our anti-androgenic study was done on two indigenous plants namely: *Chromolaena odoratum*, known by other names as Siam weed (English) and *akintola-ta-ku* (Yoruba), and *Cnidocolous aconitifolius* known as tree spinach (English), *efo iyana ipaja*, or *efo Jerusalem* (Yoruba). These plants possessed anti-androgenic activities by decreasing the testosterone concentration of the animals and depriving the androgen

dependent organs from testosterone (Yakubu *et al.*, 2007c; Yakubu *et al.*, 2011c). **Their clinical benefits are in the management of androgen-related diseases like cancer of the prostate, hirsutism, male pattern baldness and Polycystic Ovarian Syndrome** (Sheehan, 2004).

## 7.2. On Diarrhoea

Diarrhoea is a condition in which watery faeces are frequently discharged from the bowels. It accounts for 1 in 9 child deaths worldwide. In Nigeria, the prevalence of diarrhoea is as high as 18.8%, above the average of 16%, (Olawuyi *et al.*, 2004). My students and I studied the antidiarrhoeal properties of *Ceratotheca sesamoides* known also as False Sesame (English) and *Ekú* (Yoruba-Western Nigeria); *Mangifera indica*, commonly known as mango (English), *Mangoro* (Yoruba – Western Nigeria), *Mangwaro* (Hausa – Northern Nigeria) and *Mangolo* (Igbo – Eastern Nigeria); and *Musa paradisiaca*, also commonly called plantain (English), *ogede agbagba* (Yoruba), *ayabar turawa* (Hausa), and *ogadejioke* (Igbo). Our findings revealed that the plants and or their sap contained relevant secondary antidiarrhoeal bioactive agents that prolonged the onset time of diarrhoea, increased the inhibition of defecations and small intestine sodium-potassium adenosine triphosphatase ( $\text{Na}^+\text{-K}^+\text{-ATPase}$ ) activity. The nitric oxide content of the animals were also decreased. **These plants can thus be explored as an alternative in the management of diarrhoea** (Yakubu *et al.*, 2012b; 2015b; Yakubu and Salimon, 2015) as people with diarrhoea will not think of any **four O'clock activity** let alone **reproduction**.

### 7.3. On Cancer

**Cancer** is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. According to the American Cancer Society, **cancer is the second most common cause of death** and accounts for nearly 1 of every 4 deaths. The World Health Organisation (2012) estimates that there were 4 million new cancer cases and 8.2 million cancer-related deaths worldwide. Drs Taofik Ajiboye, and Ahmad Kayode Salau under my supervision and that of Prof. A. T. Oladiji evaluated some of our indigenous plants for anticancer activities. We reported that the 1:1 mixture of *Anogeissus leiocarpus* (chewing stick tree in English, *Ayin* in Yoruba, south western Nigeria) and *Terminalia avicennioides* (*Baushe*, Hausa, northern Nigeria; *Idi*, Yoruba; *Edo*, Igbo,) root barks as well as the methanolic extracts of Lophirones B and C obtained from *Lophira alata* (*Ekki* in Yoruba, *Aba*, *Akufo* in Igbo) stem bark exhibited *in vitro* antiproliferative activity against Ehrlich ascites carcinoma cell lines. The plants also produced concentration-dependent reduction in 4-nitro-o-aminophenylenediamine and benzo[a]pyrene-induced frame shift mutation and aflatoxin B<sub>1</sub>-induced base pair substitution (Salau, Yakubu and Oladiji, 2013; Ajiboye, Yakubu and Oladiji, 2014b). All these suggest the potentials of these indigenous plants in managing cancer.

### 7.4. On Free Radicals and Antioxidants

Mr. Vice-Chancellor, Sir, the field of antioxidants and free radicals is often perceived as focused around the use of antioxidant supplements to prevent human diseases. Free radicals are molecules or molecular fragments containing one or more unpaired electrons in atomic or

molecular orbital. In contrast, a substance that reduces damage due to oxygen, such as that caused by free radicals is referred to as an antioxidant. Well-known antioxidants including enzymes and other substances, such as vitamin C, vitamin E, and beta carotene, are capable of counteracting the damaging effects of oxidation. We (my postgraduate students and I) carried out researches to unveil the antioxidant potentials inherent in our indigenous plants and concluded that the:

i. aqueous extracts of *Fadogia agrestis* stem, *Chasmanthera dependens* root and *Parquetina nigrescens* leaves exhibited both *in vitro* and *in vivo* antioxidant activities by increasing the levels of testicular antioxidant enzymes in Wistar rats and decreased the levels of malondialdehyde, a major end product of lipid peroxidation, used to assess the extent of oxidative stress in biological system;

ii. the mixture of aqueous root bark extracts of *Anogeissus leiocarpus* and *Terminalia avi-cennioides* (1:1w/w) showed the highest activity, which compared favourably with the reference antioxidant, curcumin. The antioxidant activity of the extracts and their mixture might account, in part, for their mechanism of action in the management of diseases like cancer (Salau, Yakubu and Oladiji, 2015).

Oxidative stress (imbalance between the production of free radicals and the ability of the body to counteract their harmful effects through neutralisation by antioxidants) has been implicated in the pathogenesis of infertility (Sekhon *et al.*, 2010). Sperm cells are particularly prone to free radical damage because of the presence of large amount of polyunsaturated fatty acids and when this occurs, it will damage the sperm cells and consequently

could cause male infertility. Free radicals precipitate several pathologies in the female reproductive tract like endometriosis, PCOS, abnormal fertilization, recurrent pregnancy loss, pre-term labour and tubal factor infertility through mechanisms such as lipid damage, inhibition of protein synthesis and depletion of adenosine triphosphate (ATP) (Sekhon *et al.*, 2010). Oral antioxidant supplementation through the consumption of these plants and others with antioxidant activity/property may prevent and alleviate oxidative stress and its contribution to the pathogenesis of obstetrical disease (such as preeclampsia and recurrent pregnancy loss), gynecological disorders (such as polycystic ovarian syndrome and endometriosis), male infertility, cancer, diabetes, Alzheimers disease, etc. Antioxidants of plant origin with free-radical scavenging properties could have great importance as prophylactic and therapeutic agents in several diseases caused by oxidative stress and may account in part to reversing infertility in the animals.

### **7.5. On Diabetes Mellitus**

Diabetes mellitus is a common metabolic disorder characterised by hyperglycemia (high blood sugar), glycosuria (excess of sugar in the urine), polyuria (excessive or abnormally large production or passage of urine, usually greater than 2.5 or 3 litres in 24 hours in an adult) and polydipsia (excessive thirst) induced by insulin deficiency and insulin resistance. The increasing worldwide prevalence (currently more than 180 million people worldwide) in adults constitutes a global public health burden. Chronic diabetes leads to long term damage, dysfunction and failure of the organs, sexual inadequacies and loss of weight. Antidiabetic drugs such

as biguanides and sulfonylurea are associated with shortcomings such as worsening of ear diseases, weight gain leading to obesity and hypoglycemia. Therefore, the need to continue to search for complementary and alternative options in plants cannot be overemphasized. Our findings revealed that aqueous extract of *Cochlospermum palmchonii* (Gbehutu or feru-Yoruba) root, *Ficus exasperata* otherwise known as Sandpaper leaf (English), *Ewe ipin* or *Eepin* (Yoruba-Western Nigeria), *Baure* (Hausa-Northern Nigeria) and *Fadogia agrestis* (black aphrodisiac-English, *bakin gai gai*, Hausa) possessed anti-hyperglycemic activity similar to the reference drug, glibenclamide, and can control some of the disorders associated with diabetes. This is evident from the ability of the plant extracts to reverse the alloxan-treatment related hyperglycemia, elevate levels of lipids and other serum biomolecules as well as reduce the activities of carbohydrate metabolizing enzymes (hexokinase and phosphofructokinase) (Yakubu *et al.*, 2010b; 2014b; Yakubu and Ogunro, 2014; Yakubu *et al.*, 2016). We also found that aqueous extract of *Senna fistula* flower (Golden shower, (English) and *Aidantoro* (Yoruba, Western Nigeria) leaves ameliorated various metabolic derangements including hyperglycemia associated with streptozotocin in Wistar rats and concluded that the plant extract was effective as an antidiabetic agent (Ayinla, Owoyele and Yakubu, 2014).

## **Conclusion**

The importance of herbal remedies/products in the management/treatment of several types of sexual inadequacies (disorders of arousal, libido, erectile dysfunction, premature ejaculation, failure to



detumescence) and reproductive inadequacies (abnormal functioning of the reproductive organs, low sperm count, androgen related diseases, infertility, polycystic ovarian syndrome) in males and females is undeniable. These medicinal plants are indeed, efficacious, affordable and have widespread availability with minimal or reduced side effects compared to the orthodox options. Nigeria is richly blessed with these natural resources, and therefore, medicinal plants should be explored to **KNOCK DOWN THE BARRIERS TO FOUR O' CLOCK ACTIVITIES AND REPRODUCTIVE INADEQUACIES** and lessen societal problems, marital discord, adultery, divorce, broken homes and childless marriages.

Mr. Vice-Chancellor Sir, distinguished ladies and gentlemen, I will want to draw the curtain on this lecture with the following:

*Please ensure that you take the right decision to **KNOCK DOWN THE BARRIERS** militating against **FOUR O' CLOCK ACTIVITIES AND REPRODUCTIVE INADEQUACIES** so that the human cycle does not come to an end*

*Always remember that **Four O'clock activities** which can result in reproduction are for **ONLY legitimate couples***

## **Recommendations**

In the light of the foregoing, I hereby recommend the following to the target audience:

### **A. The General Populace**

1. Couples and potential couples should be sensitised not to pretend when discussing sexual matters with their partners. The discourse on sexual and reproductive

issues should no longer be regarded as a taboo, subject of controversy and extreme secrecy since they are essential parts of quality of life.

2. Sex is the most powerful creative force given to man. People should not play carelessly with this powerful force outside the bounds of marriage. If they do, it will destroy them and those close to them.
3. Sexual and reproductive dysfunctions are common among men and women in the world, Nigeria inclusive, and as such, regular screening/check-ups by individuals is highly advocated.
4. There is the need for the generations of today to bridge the gap with the old people on the rich cultural heritage of traditional medicine by learning the art.

## **B. The Researchers**

5. There should be accurate and sufficient data on the prevalence of sexual dysfunction and reproductive dysfunction in Nigeria, as estimates of prevalence/occurrence are important in understanding the true burden of male and female sexual dysfunction and in identifying risk factors for prevention efforts.
6. The development of a compendium of indigenous plants with potential and clinical benefits for reproductive health is hereby advocated.
7. Clinical and representative studies should be encouraged in order to complete the evaluation of the potential effects of medicinal plants in the treatment of sexual and reproductive inadequacies of males and females. It is also important for physicians **knocking down sexual and reproductive inadequacies** to have some knowledge of the medicinal plants whose

relevant scientific investigations have been done and how to combine this therapy with modern ones.

### **C. The Government**

8. The Government should develop our own traditional medical systems that should be appropriately tagged Naija Traditional Medicine.
9. The government of Nigeria should wake up to the health benefits and economic advantages of herbal medicines, set up guidelines and policies on the use of medicinal plants, create a conducive environment by supporting research with grants that will involve industry-linkages and integrate such into the health care delivery system as it is done in some countries like India.
10. National Agency for Food and Drug Administration and Control (NAFDAC) and other relevant agencies should step up their regulatory mechanisms to make Nigerian herbal products meet good manufacturing practices and global standards.
11. The establishment of rapport between modern health workers through collaborative ventures with traditional healers and relevant Non-Governmental Organisations (NGOs) by having close supervision and monitoring of herbal treatments in such conditions is desirable and noble.
12. Herbal remedies should begin to carry proper warning labels that enable consumers to know the contents of their remedies and unlabeled products on the shelf should be looked at with suspicion.
13. Management and conservation of our indigenous plants as well as commercialisation and exportation of herbal remedies is hereby advocated.

14. The teaching of general aspects of Traditional Medicine of Nigeria should be incorporated into the secondary school syllabus.

#### **D. The University**

15. For us to properly identify a medicinal plant, scientifically identify its bioactive contents, and know its pharmacological properties and the side effects of a medicinal plant, such a plant needs to be subjected to thorough investigations in a well equipped phytomedicine laboratory. I am therefore advocating for the establishment of several phytomedicine laboratories and ethnomedicinal research centres in universities, that are equipped with the state-of-the-art equipment and facilities, with University of Ilorin taking the lead.

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In closing, I want to once again appreciate the Vice-Chancellor of this University for providing a cocktail for my Guests. I also want to use this medium to invite you all to a reception on 1<sup>st</sup> October, 2016 at the Auditorium of Al-Hikmah University, Ilorin, beginning from 10:00am.

**Thank you all for your time**



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