

UNIVERSITY OF PORT HARCOURT

***CRUDE OIL: SWEET AND SOUR-
EFFORTS AT MITIGATING THE
TOXIC EFFECTS***

An Inaugural Lecture

By

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DEDICATION

With humility I dedicate this lecture to;

1. My mentor, teacher and academic father Late Prof. R. N. P. Nwankwoala.
2. My mother Late Mrs. Ineyi A. Georgewill and my grandmother Late Mrs. Laura M. Oribu
3. My lovely wife Dr. (Mrs.) Udeme O. Georgewill and my children Barrister Melford, Miss Tamunoemi, Miss Tamunodein and Miss Tamunobakam.
4. My beloved twin brother, Hon Justice Biobele A. Georgewill and his family.

ACKNOWLEDGEMENT

I wish to express with reverence my utmost gratitude to God. He from whom all goodness flows, for everything I am today and for everything I will be tomorrow, to Him be all the glory, honour and adoration, for without Him, I am nothing.

I lack words enough to thank my mother, Mrs. Ineyi A. Georgewill and my maternal grandmother Mrs. Laura M. Oribu both of blessed memory for all their love, care and sacrifices for me and my twin after the cold hands of death snatched away our father when we were just one year old. They toiled, sold their belongings, wrappers and all they had to give us a sound education, may their beautiful souls continue to rest in peace. To my father Mr. Abraham O. Georgewill, I say thank you for bringing me into the world, though I did not know you well enough, may you continue to rest from your labours.

My lovely and beloved wife Dr. (Mrs) Udeme O. Georgewill and my children Barrister Melford, Miss Tamunoemi, Miss Tamunodein and Miss Tamunobakam, I appreciate you all for being there for me through thick and thin. I cherish you all very greatly for all your tremendous support and stability at the home front. My wife, I thank you also for being a dependable research partner. God bless you all.

My beloved Twin brother Hon. Justice Biobele A. Georgewill, my inseparable twin, for 47 years, no day has passed without our

talking to each other, without our caring for each other. I am indeed grateful to God for making you my Twin brother. I cannot thank you enough for all we have been to each other. God bless and keep you always. God bless and keep your lovely wife Dame Funmilayo B. Georgewill and your children, Faustinah, Lolita, Ella and Princess. My siblings, Dr. Dawaye A. Georgewill/family, Mr. Opu A. Georgewill/family, Madam Abrahamba Georgewill/family, Hon. Oribi/family and Ijuba. I remain ever grateful for all your love and care. My uncles, Chief Walter O. A Akpana, Prof. R.S Oruamabo, Prof. K. A. Harrison, High Chief & Pastor (Mrs) O. B. Lulu-Briggs, Chief Asara A. Asara, Chief A. G. Oweredaba. I appreciate all your encouragement in my career and life struggles. My parents- in- law Dr. & Mrs. Dominic Peter Uyanga and family I thank you for all you have done for me since our paths crossed each other.

I acknowledge with gratitude all my teachers from primary school through my university education for turning me from nothing to something, for all your commitment to making me a good doctor, a good teacher, a good researcher, a good administrator, I remain eternally grateful to you all. I remember and appreciate with tears in my eyes, my teacher, my mentor, my academic father Prof. Reginald Nwairegbu Pawa Nwankwoala of blessed memory without whom I would not have taken a career in Pharmacology and would not have been a Professor of Pharmacology and would not be giving a lecture on Pharmacology. You loved me, cared for me, you tutored me, you taught me how to teach, you taught me how to carry out research, you taught me how to develop a

research mind, to you I remain eternally grateful for making me who I am today.

Let me also appreciate my colleagues and staff in the Department of Pharmacology, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port Harcourt and the Niger Delta University for all your support and encouragement in my career; Prof. Nimi D. Briggs, Prof. Don Baridam, Prof J. A. Ajienska, Prof. Chris Akani, Prof. Nelson Brambaifa, Prof. (Mrs) O. O. Ebong, Prof. A. W. Obianime, Prof. Hope Obianwu, Prof. Obodo, Prof. Didia, Prof. Prince Unekwe, Prof. I. M. Siminialayi, Prof. Ogoni, Acting VC, Niger Delta University, Prof. Chris Ikporukpo, Prof. R. Konya, Prof. Bene Willie Abbey, Prof. H. Fawehinmi, Prof. Nwafor, Prof. D. V. Dapper, Dr (Mrs.) U.O.Georgewill, Dr. H.Kagbo, Dr. J. Aprioku, Dr. Eyearu, Dr. Joachim Odigie, Mrs. Ekine, Mrs. Mathilda Deekor, Joshua Isirima, Charity Jones, chief Daniel Nsane, Tubobelem, Kabari, Biiragbara, Michael, Mina and Mathilda. I am indeed very grateful to you all.

To all my students (Undergraduate and Post Graduate), past and present, I thank you.

Let me specifically thank Hon. Justice Biobele A. Georgewill, Dr (Mrs) Udeme O. Georgewill, Barrister Melford O. Georgewill and Mr. Mr. Williams Wordi for proof reading this lecture.

I have saved the best for the concluding segment of my appreciation, let me whole heartedly and with utmost joy, thank the Vice Chancellor Prof. Joseph Atubokiki Ajienska for giving me this opportunity to stand before you all to deliver my inaugural lecture, Sir, I appreciate you greatly for providing the enabling

environment for research to thrive in this university. Registrar, Ma, Mrs. Mathilda Nnodim, I appreciate you for your support. To the Principal Officers, Provost, Deans and Heads of Departments I say thank you for all your support.

Owunari Abraham Georgewill

CRUDE OIL: SWEET AND SOUR; EFFORTS AT MITIGATING THE TOXIC EFFECTS

PREAMBLE

In 1956, in the sleepy town of Oloibiri in the Niger Delta, Crude oil was first discovered in commercial quantities. The discovery was made by Shell BP. Nigeria joined the rank of oil producers in 1958 when its first oil field came on stream producing 5,100 barrels per day. Petroleum soon thereafter became the main contributor to physical development of infrastructural facilities in Nigeria and provided the revenue for the diversification of the nation's agriculture. As the eight largest oil producing country in the world, Nigeria's economy is highly dependent on fossil fuels in energy production, industry and transportation. It is the lifeline to modern industrial revolution in Nigeria.

In June 1997, aged and corroded pipelines gave way to pressure and over 280 barrels of petroleum oil spilled and affected the people of Asitubo Gbanraun in Bayelsa State of Nigeria. The spilled oil was not cleaned up for over six months; there was interference in the food chain (ecosystem). Humans showed signs and symptoms of crude oil toxicity which included amongst others frequent abortions (miscarriages), secondary infertility, and many cases of deaths of human inhabitants. This singular event aroused our curiosity as toxicologists and provided the impetus for our foray into investigating the toxic effects of crude oil, culminating

in the elucidation of the mechanisms of crude oil toxicities. Vice Chancellor Sir, as we gained more insight into the mechanism of crude oil toxicities over the years in our research, we ventured into how to mitigate the deleterious effects of crude oil based on our knowledge of the mechanism of toxicities of crude oil. This was how it all started. . .

INTRODUCTION

The word “Toxicology” is derived from the Greek words “toxicos” meaning poisonous and “logos” meaning study. It is thus defined as the study of the adverse effects of chemicals on living organisms. Paracelsus 1493-1541 is regarded as the Father of toxicology and is credited with the classic toxicology maxim “all substances are poisonous and nothing is without poison, only the dose makes a substance not a poison”. This maxim is now popularly referred to as: the dose makes the poison”. He posited that even water in large enough dose can produce water intoxication whereas snake venom below the lethal dose will not produce any detectable toxic effect. Ted Loomiss, the father of modern toxicology proposed two main principles in carrying out descriptive toxicity studies, these two principles have guided us throughout our research effort on the toxicities of crude oil. He stated that the effects of chemicals produced in laboratory animals when properly quantified applied to toxicity in human beings. He posited further that when calculated on the basis of dose per unit of body surface area, concentrations in humans is equivalent to the concentrations in animals, thus, on the basis of body weight, the effects on humans is greater than the effect observed in animals at similar concentration. Ted Loomiss’s second principle

states that “Exposure of laboratory animals to high doses of a substance is a valid method for predicting possible hazards in humans exposed to much lower doses.

SUBDISCIPLINES OF TOXICOLOGY

TOXICOGENOMICS: This is an area of toxicology that involves the application of molecular profiling approaches to the study of toxicology.

AQUATIC TOXICOLOGY: This is an area of toxicology that concerns itself with the effects of substances on aquatic life.

FORENSIC TOXICOLOGY: Concerns itself with the medico-legal aspects of chemicals and post mortems.

CLINICAL TOXICOLOGY: Is concerned primarily with the diagnosis and treatment of toxic substance induced toxicity in humans.

ENVIRONMENTAL TOXICOLOGY: Studies the harmful effects of chemicals, biological and physical agents on living organisms.

TOXICITY

This is the degree to which a substance can damage an organism. It may affect the whole organism or substructure of the organism such as the cell (Cytotoxicity) or an organ (organo toxicity for example, Hepatotoxicity if the liver is affected). There are in general, three types of toxic agents namely;

- Chemical Toxicants which include lead, mercury, asbestos, chlorine gas, methyl alcohol, crude oil amongst others.

- Biological toxicants: Which include bacteria viruses and fungi.
- Physical toxicants: Which includes, coal dust, extremes of cold and heat.

Let me at this point state that of more concern in recent times to the toxicologist is the toxicity of metabolites. Many substances regarded as poison are toxic only indirectly for example; methanol is converted to formaldehyde and formic acid in the liver. These metabolites are responsible for the toxic effects of methanol exposure on the liver. Most intriguing to us, in our research efforts on crude oil toxicity is the finding that Benzene, a seemingly unarmful chemical in crude oil, undergoes lethal synthesis to a potent carcinogen Benzene Arene oxide in living systems.

Cumulative toxic effects which result from chronic exposure to low concentration of substances in the environment over a period of time and delayed toxic effects which are observed in future generation of humans chronically exposed to substances now occupy the front burner in modern toxicology discourse.

CRUDE OIL

Crude oil is unrefined petroleum. It can vary in composition, viscosity, density and flammability. Petroleum derived materials and by-products are major oil pollutants. The word petroleum is derived from the Latin words “Petra” meaning rock and “oleum” meaning oil. Crude oil is a naturally occurring flammable liquid, consisting of a complex mixture of hydrocarbons of various molecular weight and other liquid organic compounds that are

found in geologic formations beneath the earth's surface. Petroleum is recovered mostly through oil drilling.



An Oil Rig

The term "rig" generally refers to the complex of equipment that is used to penetrate the surface of the Earth's crust. A drilling rig is a machine which creates holes in the ground. Drilling rigs can be massive structures housing equipment used to drill oil wells, or natural gas extraction wells.. Drilling rigs can be mobile equipment mounted on trucks, tracks or trailers, or more permanent land or marine-based structures such as oil platforms, commonly called offshore oil rigs.

Crude oil is refined and separated most easily by boiling point into a large number of consumer products from petrol (or gasoline) and kerosene, to asphalt and chemical reagents used to make

plastics and pharmaceuticals. The world consumes about 88 million barrels each day. Crude oil may be considered light if it has low density or heavy, if it has high density and it may be referred to as sweet if it contains relatively little sulfur or sour if it contains substantial amount of sulfur. The petroleum industry is involved in the global processes of exploration, extraction, refining, transporting (often with oil tankers and pipelines) and marketing petroleum products. The industry is usually divided into three major components: Upstream, Midstream and Downstream. (Vassihou Marcus 2009).

THE CHEMICAL CONSTITUENTS OF PETROLEUM CRUDE OIL

The constituents of petroleum crude oil include; methane (CH_4), Ethane (C_2H_6), Propane (C_2H_8), Isobutane ($1\text{-C}_4\text{H}_{10}$), N-Butane ($\text{N-C}_4\text{H}_{10}$), Pentane (C_5H_{12}), Hexanes (C_6H_{14}), Octanes (C_8H_{18}), Decane ($\text{C}_{10}\text{H}_{22}$), Tetradecanes ($\text{C}_{14}\text{H}_{30}$), Dexadecane ($\text{C}_{16}\text{H}_{22}$), Tetracontane ($\text{C}_{40}\text{H}_{82}$), Triacontane ($\text{C}_{30}\text{H}_{62}$), Asphalterie ($\text{C}_{80}\text{H}_{162}$) Post Huma J. 1977.

The biotransformation of an unharmed substance to a very active and lethal substance is defined as lethal synthesis (Neff 1997, Klassen 1990). Benzene is not known to be genotoxic; that is, a cancer causing agent. However, the putative metabolite of benzene, Benzene Arene oxide is indeed genotoxic. It caused leukemia and the threshold value was set at 1ppm (Synder et al 1977, Major 1922). Other metabolites of aromatic hydrocarbons such as benzo(a)Pyrene, 3-methyl cholanthrene, benzathracene,

dibenz(a)anthracene and toluene were carcinogenic. Aniline derivatives are also carcinogenic (Jerina et al 1977).

CRUDE OIL: THE SWEET

For the past three decades, crude oil has been a major source of revenue, energy and foreign exchange for the Nigerian economy. Oil being the mainstay of Nigerian economy plays a vital role in shaping the economic and political destiny of the country. Large proceeds are obtained from the domestic sales and exports of petroleum products. Oil and gas exports, account for more than 98% of export earning and about 83% of Federal Government revenue. Nigeria's proven oil reserves are estimated to be 35 billion barrels; natural gas reserves are well over 100 trillion ft³ (2,800mi³). Nigeria is a member of the Organization of Petroleum Exporting Countries (OPEC) with a crude oil production average around 2.6 million barrels (350, 000mi³) per day (Egbogah, 2006). Nigeria provides about 10% of overall U.S. oil imports and ranks as the fifth largest source for U.S. imported oil. The stock of U.S investment is nearly 7 billion dollars, mostly in the energy sector. Liquefied natural gas exportation started in 1999 and will expand significantly when gas flaring is completely eliminated (Gbadebo, O. O., 2008).

Elimination of gas flaring has two major advantages:

1. Increased revenue earning due to availability of more liquefied natural gas for exportation, which will translate to higher revenue for the nation.

2. Reduction of environmental issues such as Acid rain, Ozone layer depletion and Global warming.

Acid Rain is caused by emission of sulphur dioxide and nitrogen oxide from crude oil following gas flaring, which reacts with water molecules in the atmosphere to produce acid rain.

Ozone layer depletion caused by free radical catalyst including nitrous oxide, nitric oxide and hydroxyl. Nitrogen oxide is the largest ozone depleting substance and is emitted from crude oil following gas flaring.

Global Warming is the increase of Earth's average surface temperature due to effect of greenhouse gases, such as carbon dioxide emissions from burning fossil fuels, which trap heat that would otherwise escape from Earth. This is a type of *greenhouse effect*. Even slight increases in atmospheric levels of carbon dioxide (CO₂) can cause a substantial increase in temperature. CO₂ remain in the atmosphere for a very long time. More CO₂ means that the balance occurs at higher temperatures. Increase in CO₂ concentration in the atmosphere is almost perfectly correlated with increases in fossil fuel combustion emissions. The simple fact is that under "business as usual" conditions, we'll soon reach carbon dioxide concentrations that haven't been seen on Earth in the last 50 million years. Combustion of Fossil Fuels, result in the total worldwide emission of about 22 billion tons of carbon dioxide to the atmosphere each year. This enormous input of CO₂ is causing the atmospheric levels of CO₂ to rise dramatically.



The images of gas flaring

As the price of crude oil, rises at the global market, Nigeria's external earning increases. Nigeria began to generate more revenue from crude oil sales than it budgeted leading to creation

of excess crude oil savings. The total oil revenue generated into the federation account from 2000 to 2009 amounted to 34.2 trillion naira representing 82.36% of total revenue of the nation (Ogbona and Appah 2012).

Nigeria has a total of 129 oil fields and 1,481 wells in operation (Ministry of Petroleum Resources). The most productive region of the nation is the coastal Niger Delta Basin in the Niger Delta or South-South region which encompasses 78 of the 159 oil fields. Nigeria's petroleum is classified as light and sweet. Nigerian is the largest producer of sweet oil in OPEC.

THE NIGERIAN BUDGET

For every fiscal year, the National Budget of Nigeria is based on the number of barrels of crude oil to be sold that year. The 2012 budget of 4.749 trillion naira is premised on an oil price benchmark of 70 dollars per barrel for a total production of 2.54 million barrels a day at an exchange rate of 155 naira to a dollar. There is therefore no gainsaying the fact that without crude oil there will be no national budget at least for now- How Sweet crude oil is.

ABUJA: FEDERAL CAPITAL TERRITORY

Abuja is the capital city of Nigeria. It is a planned city. It is the seat of power in Nigeria and has the Presidential complex, National assembly Complex, Supreme Court Complex, The Nigerian National Mosque, The Nigerian National Christian Centre and it is served by the state of the art Nnamdi Azikiwe International Airport. Abuja is adjudged as the best purpose-built city in Africa

and one of the wealthiest cities in Africa- How Sweet crude oil is. It is an unarguable fact that without crude oil petro dollars the city would not be what it is.







Images of Abuja

The master plan for Abuja was developed by International Planning Associates (IPA), a consortium of three American firms. Kenzo Tange a renowned Japanese architect designed the monumental core of Abuja. Abuja is the Headquarters of the Economic Community of West African States (ECOWAS) and the Regional Headquarters of OPEC. The Abuja skyline is made up of mostly mid-range and tall buildings. Most of the buildings are modern, reflecting the status of this awesome new city. The Millennium Tower designed by the Italian Architect Manfredi Nicoletti is currently under construction and will loom 170 meters above the city. The Millennium Park, the largest of its kind in Africa was also designed by this world renowned architect and was officially opened by the United Kingdom's Elizabeth II in December 2003.

Vice Chancellor Sir, kindly permit me to borrow the phrase used by Emeritus Professor Anosike “In praise of enzymes”; “In praise of Crude oil”, It is indeed true that crude oil is sweet.

To be fair to the oil industry operators, the industry makes variety of contributions to the Nigerian economy in the areas of creation of Employment Opportunities, Local Expenditure on Goods and Services, Contribution to Government Revenue, Gross Domestic Product (GDP), Foreign Exchange Reserves and Supply of Energy to industry, commerce and transportation. Nigerians were employed in building of roads, bridges, infrastructures, in Seismic and Drilling Operations, Supervisory and Managerial Functions as time went on, Payment of wages and Salaries of their Nigerians workers, payment of Local Contractors, Local Purchase of Goods and Services, Scholarship Awards, Educational Grant, Donations and Subventions (Genova and Toyin 2003).

CRUDE OIL: THE SOUR

The Niger Delta comprises 70,000 square kilometres of wetlands. It is home to over 20 million people. It is the largest wetland with an incredibly well endowed ecosystem which contains one of the highest concentrations of biodiversity on the planet Earth, in addition to supporting abundant flora and fauna, arable terrain that can sustain wide varieties of crops, economic trees and more species of fresh water fish than any ecosystem in West Africa.

As far back as 1983, the NNPC issued a report on the emerging environmental degradation as a result of crude oil exploration, long before popular unrest surfaced- “we witnessed the slow

poisoning of the waters of this country and the destruction of its vegetations and agricultural lands by oil spills which occur during petroleum operations, and there has been no concerted efforts on the part of the oil operators to control environmental problems associated with the industry” (Baird J. 2010).

Oil spills in Nigeria are a common occurrence. It has been estimated that between 9 million to 13 million barrels have been spilled since oil drilling started in 1958. Oil spillage has a major impact on the ecosystems, large tracts of the mangrove forests have been destroyed, and contamination of groundwater and soils produces extermination of crops and aquaculture. Drinking water is also frequently contaminated leading to deleterious effects on humans and a decline in local fishing productions. Crude oil spillage may occur during the processes of tapping or transportation of crude oil through corroded pipes. Crude oil may pollute the environment via tanker and barge accidents; blow out at offshore drilling rigs, operations of offshore well, washing of crude oil tankers as well as pipeline and storage tank leakages. Crude oil contaminated or polluted water may be used for drinking, bathing and cooking. The contaminated air may be inhaled while the contaminated fishes and other food substances may be eaten by humans.





Images of Crude oil spills

In 1997, aged and corroded pipelines gave way to pressure and over 280 barrels of petroleum oil spilled and affected the people of Asitubo Gbanraun in Bayelsa State of Nigeria. The spilled oil was not cleared up for over six months; there was interference in the food chain (ecosystem). Humans showed signs and symptoms of varied dimension in that community. Our curiosity was aroused and we investigated the toxic effect of crude oil on laboratory animal with a view to ascertaining whether the effects observed in human inhabitants is as a result of the chronic exposure to the crude oil, bearing in mind Ted Loomiss's Principles of Toxicity Studies. It is our considered view that if the laboratory animal

showed similar signs and symptoms as the humans in that community, then we would have provided a scientific insight into the deleterious effects of crude oil. Crude oil was obtained from the site of spillage, test laboratory animals (rats) had their food and water contaminated with 250 mls of crude oil to 500 mls of tap water. Controlled group animals received unpolluted food and water. Results of this initial study revealed that the test group animals significantly lost weight, lost appetite and were weak and could not jump over the cross bars in the cages and there was no pregnancy observed among the rats that received crude oil polluted food and water. Contrary to these findings, the control group animals that received normal food and water gained weight, had good appetite and were very active. Pregnancy and delivery of little pups occurred among the control group. These findings to us indicated that chronic exposure of Nigerian crude oil to rats which could be equated to chronic exposure of the inhabitants to constant crude oil spillage, resulted in the deleterious effects observed in the rats, and explained the observed effects in the human inhabitants of the crude oil spilled areas. This work was published in a Peer Reviewed Indexed Journal.

TABLE 1: EFFECTS OF PROLONGED EXPOSURE OF RATS TO NIGERIAN CRUDE OIL

Parameter measured	Day 1		Day 7		Day 14		Day 21		Day 28	
	C	T	C	T	C	T	C	T	C	T
Weight(gm)	200± 2.00	201± 2.00	215± 1.00	196± 1.00	220± 2.00	170± 2.00	230± 1.00	165± 2.00	235± 2.00	160± 1.00
Appetite	+4	+4	+4	+3	+4	+2	+4	+2	+4	+1
Weakness	+4	+4	+4	+3	+4	+2	+4	+1	+4	+1

Pregnancy	Nil	Nil	Nil	Nil	Yes	Nil	Yes	Nil	Yes	Nil
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$P \leq 0.01$ as compared to the control values

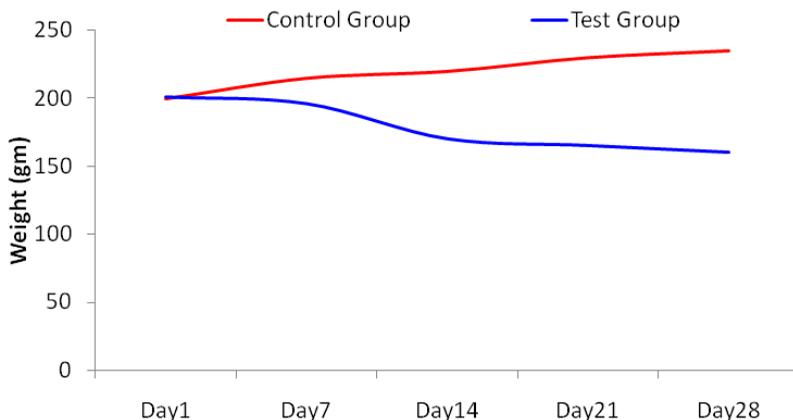


Figure 1: Effect of prolonged exposure of rats to Nigerian Crude Oil on weight

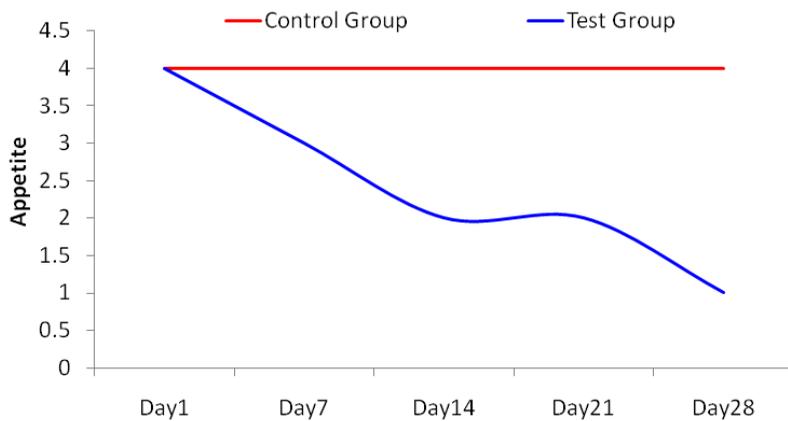


Figure 2: Effect of prolonged exposure of rats to Nigerian Crude Oil on appetite

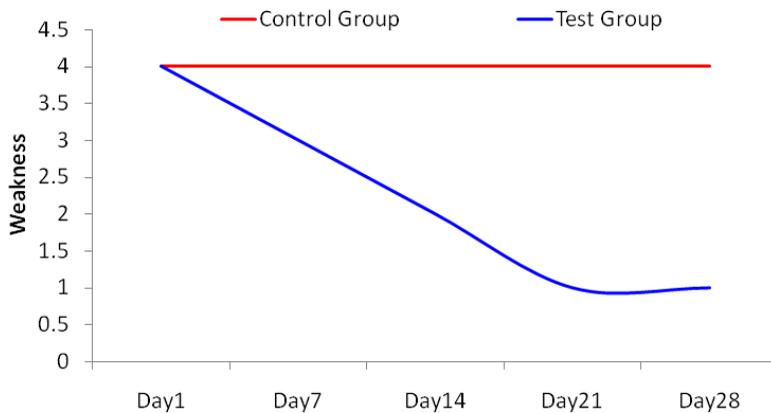


Figure 3: Effect of prolonged exposure of rats to Nigerian Crude Oil on weakness

The finding of infertility among the test group animals' was a highly disturbing finding. The physiological deficiencies that caused this observed infertility in the rat exposed to petroleum crude oil are not known. It is possible that hormonal defects might have resulted from the exposure of the rats to crude oil and may have contributed to the observed effect. It is this educated speculation that female reproductive hormones such as Follicular Stimulating Hormones, Luteinizing Hormone, Estrogen and Progesterone may have been affected and possibly involved in the mechanism of crude oil induced infertility that propelled us to further investigate the toxicities of crude oil.

Truscot et al had reported that the hydrocarbon components of crude oil could interfere with hormone synthesis. We therefore investigated the effect of crude oil on FSH, LH, estrogen and progesterone levels in female rats that were chronically exposed to

crude oil following our earlier protocol. The findings of this investigation revealed significant reductions in the levels of all the hormones assayed when compared to the control rats' hormonal levels. The physiology of LH, FSH, estrogen and progesterone as well as their absolute requirements in the initiation and maintenance of pregnancy are well established (David and Georse 2001, Moons et al 2002). We thus posited that, the significant reduction in the levels of the reproductive hormones caused by the exposure to crude oil was responsible for the observed infertility among the test group rats. This work was published in a Peer Reviewed Indexed Journal.

TABLE 2: EFFECTS OF CRUDE OIL ON REPRODUCTIVE HORMONES OF FEMALE RATS

Parameter measured	Day 1		Day 7		Day 14		Day 21		Day 28	
	C	T	C	T	C	T	C	T	C	T
LH(iu/l)	-	-	2.10 ± 0.20	2.00 ± 0.20	2.24 ± 0.20	1.60 ± 0.10	2.30 ± 0.10	1.20 ± 0.10	2.35± 0.10	1.00 ± 0.10
FSH(iu/l)	-	-	1.60 ± 0.10	1.50 ± 0.10	1.70 ± 0.20	1.40 ± 0.01	1.80 ± 0.10	1.10 ± 0.10	1.85 ± 0.10	0.60 ± 0.10
Estrogen(iu/l)	-	-	0.50 ± 0.10	0.30 ± 0.10	0.60 ± 0.10	0.20 ± 0.10	0.65 ± 0.10	0.15 ± 0.01	0.70 ± 0.10	0.11 ± 0.01

Progesterone (nmol/l)	-	-	0.80 ± 0.10	0.50 ± 0.10	0.85 ± 0.10	0.30 ± 0.10	0.95 ± 0.10	0.15 ± 0.01	0.99 ± 0.10	0.10 ± 0.01
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P ≤ 0.05 as compared to control values.

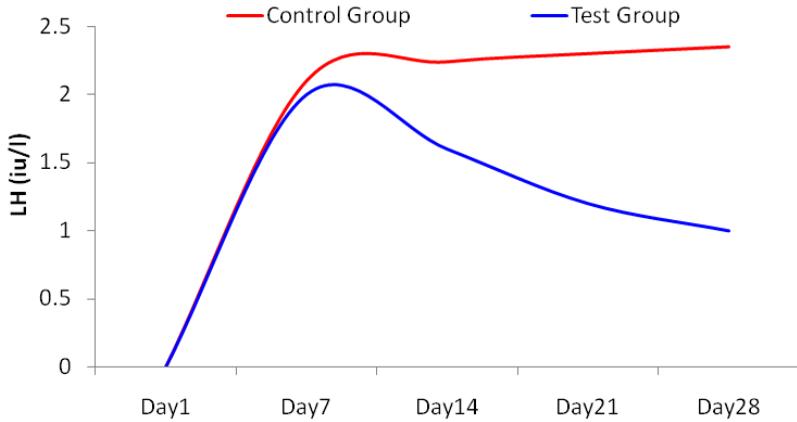


Figure 4: Effect of curde oil on leutenizing Hormones levels in female rats

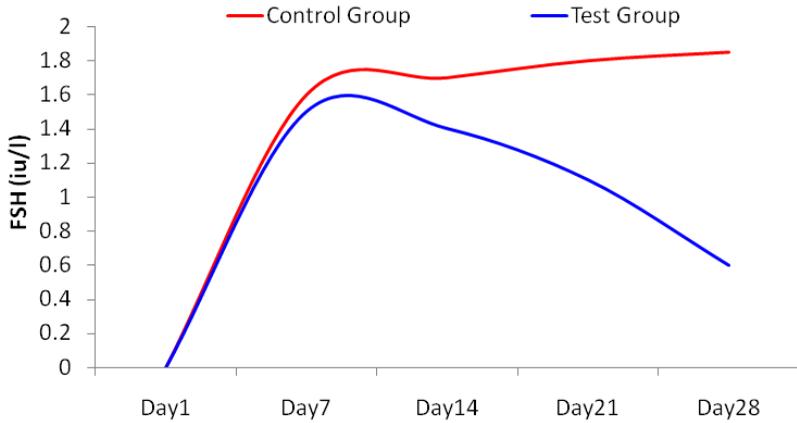


Figure 5: Effect of curde oil on Follicle stimulating Hormones levels in female rats

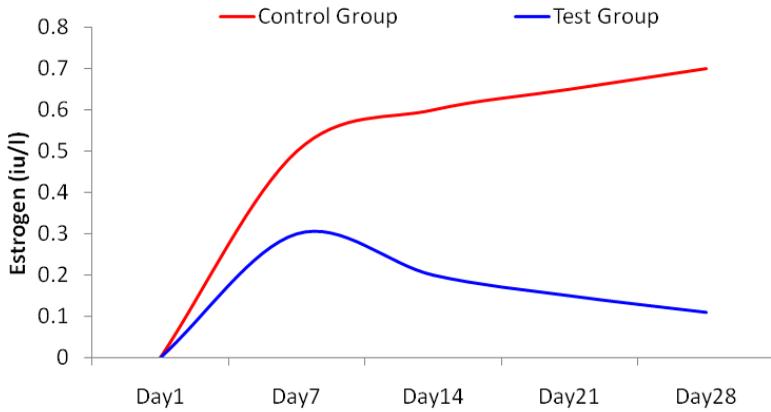


Figure 6: Effect of curde oil on Estrogen levels in female rats

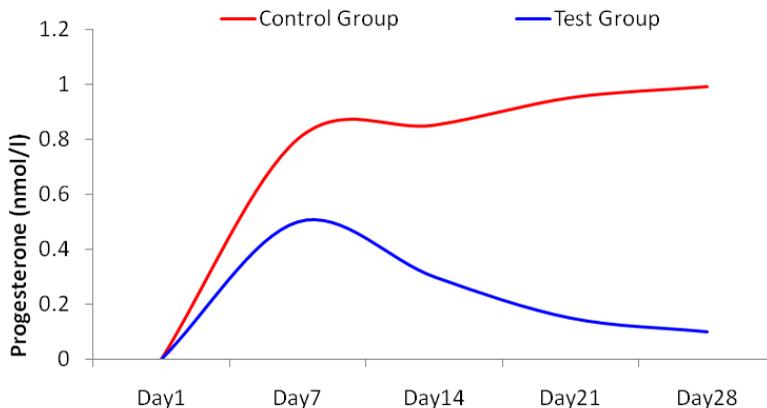


Figure 7: Effect of curde oil on progesterone levels in female rats

Ted Loomiss regarded as the father of Modern Toxicology in his treatise had posited that demonstration of toxic effect of any substance should be confirmed in at least two different species, based on this, we carried out the same study in guinea pigs, revealing similar significant reduction in the level of the reproductive hormone in the guinea pigs that were exposed chronically to crude oil. This work was published in a Peer Reviewed Indexed Journal.

Studies using male rats and guinea pigs in our laboratory also revealed similar significant reduction in testosterone levels and destruction of the leydig cells of the testis.

TABLE 3: EFFECTS OF CRUDE OIL ON TESTOSTERONE LEVELS IN MALE RATS

Parameter measured	Day 1		Day 7		Day 14		Day 21	
	C	T	C	T	C	T	C	T

Testosterone (nmol/l)	-	-	1.65 ±0.01	1.60± 0.10	1.68± 0.10	1.41± 0.10	1.89± 0.10	1.23± 0.10
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$P \leq 0.05$ as compared to control values.

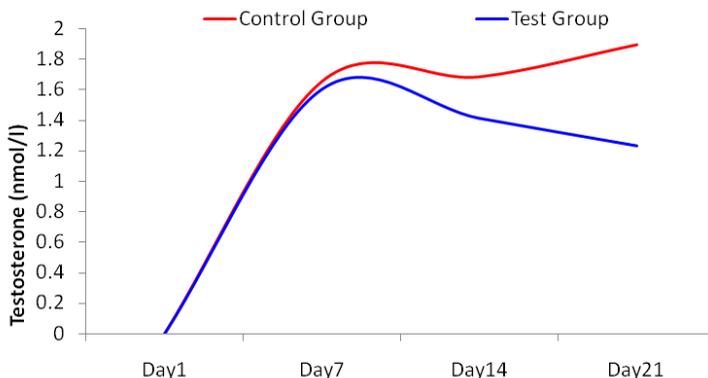


Figure 8: Effect of crude oil on Testosterone levels in male rats

In our bid to further elucidate the scientific basis for these observed toxicities in our laboratory animals exposed chronically to crude oil, we investigated the histopathological effects of prolonged exposure of Nigerian crude oil on rats. Using the same experimental protocols, we harvested the heart, liver, lungs, kidneys, ovary and testis of test group animals exposed chronically to crude oil by sacrificing the animals after the exposure to crude oil and prepared the tissues for histopathological studies. The histopathological specimens of the crude oil treated group revealed multi-organ pathology when compared to the organs of the controlled group rats that exhibited normal cellular architecture. The lungs of the test group animals showed edema and patchy intra-alveolar hemorrhage. The kidney showed tubular necrosis and interstitial hemorrhage. The heart tissue showed

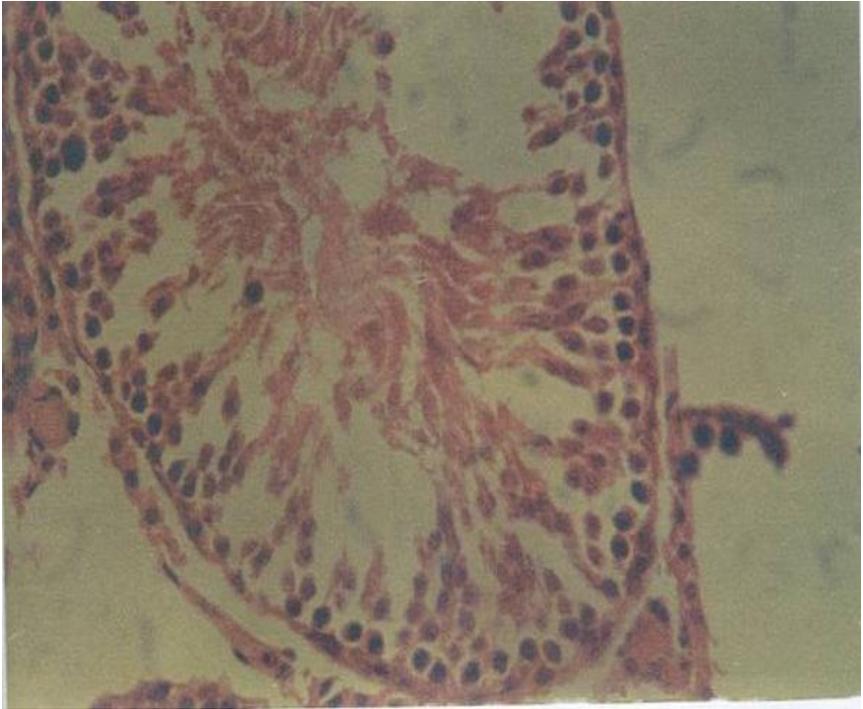
cardiac muscular congestion. The testis showed seminiferous tubule atrophy with consequent maturation arrest. These were highly disturbing findings. The death of some of these test group animals further compounded these findings. Could this explain the declining life-expectancy figures?

We also observed marked elevations of organ-specific enzymes in the rats that received crude oil polluted food and water such as elevated alanine amino transferase, aspartate transferase, alkaline phosphatase.

This work was published in a Peer Reviewed Indexed Journal.

TABLE 4: SUMMARY OF HISTOPATHOLOGICAL FINDINGS OF VARIOUS ORGANS FOLLOWING EXPOSURE OF RATS TO NIGERIAN CRUDE OIL

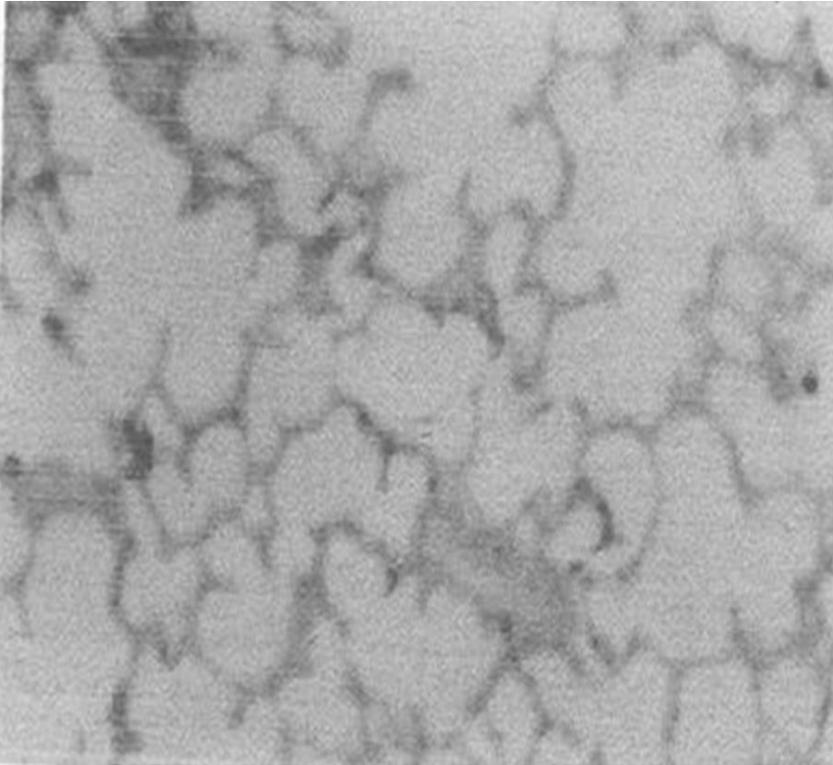
ORGAN	EFFECTS
TESTIS	Atrophy of the seminiferous tubules. Pronounced maturation arrest of leydig cells.
HEART	Cardiac muscular congestion
LUNGS	Edema and intra-alveolar haemorrhages
KIDNEYS	Tubular necrosis and Interstitial haemorrhages
LIVER	Edema of hepatic sinusoids



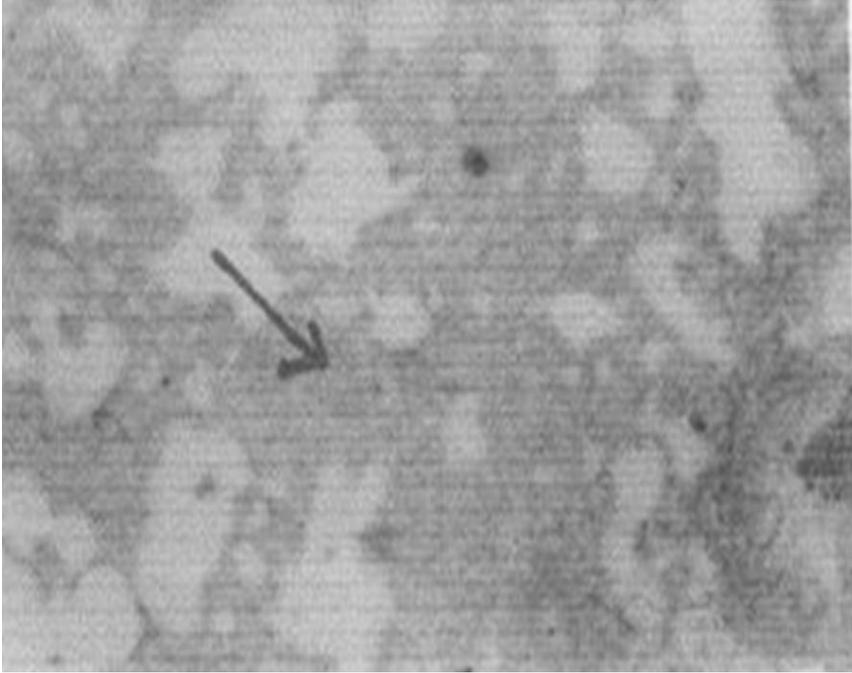
Picture 1: Photomicrograph - Control group rat Testis showing normal Architecture



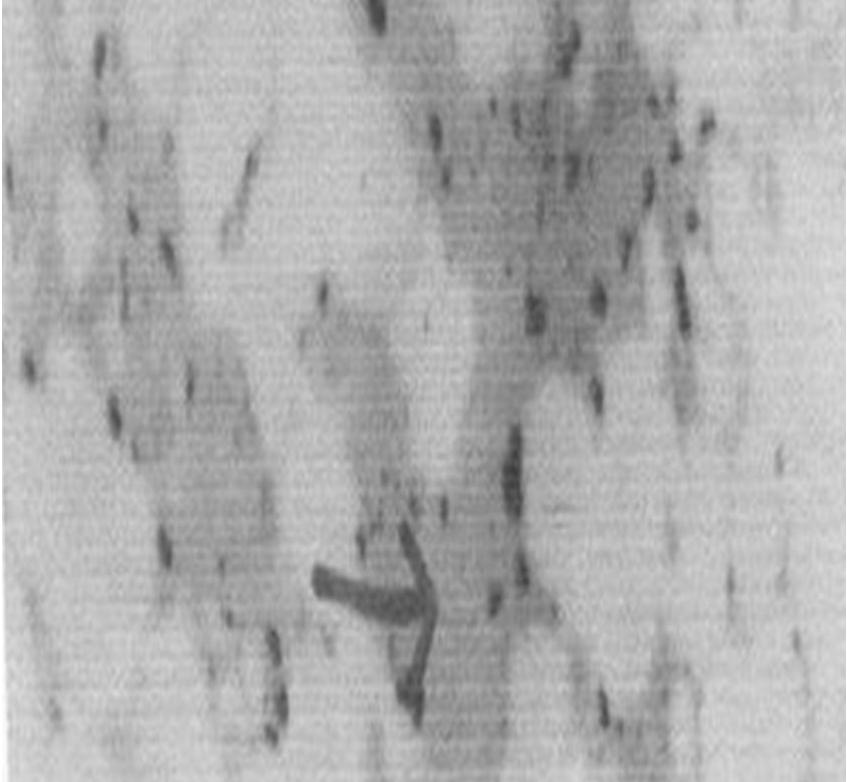
Picture 2: Photomicrograph - Testis of rat that received crude oil polluted food and water showing atrophy of the seminiferous tubules and maturation arrest.



Picture 3: Photomicrograph - Normal lung of control group rat showing normal architecture



Picture 4: Photomicrograph - Lung of rat that received crude oil polluted food and water, showing thickened alveolar walls



Picture 5: Photomicrograph - Lungs of rats that received crude oil polluted food and water showing hemorrhage in alveolar spaces.

Vice chancellor Sir, In 2005, the people of Asitubo Gbanraun having experienced the deleterious and toxic effects of crude oil spills which was not cleaned up for over six months, initiated a petition to the committee on public petitions of the National Assembly against Shell PDC. My mentor, teacher and academic father, Prof. R.N.P. Nwankwoala, and I, provided the scientific basis for the sustenance of that petition before the committee on

public petitions. Our more than a hundred paged document detailing these research findings in our laboratory on the toxic effects of crude oil outweighed the defense put forward by SPDC through other group of researchers from other universities. Oral presentations were made and after a long period of hearing of the petition, the Asitubo Gbanraun community was awarded a compensation of \$2 billion to redress all the crude oil induced toxic effects suffered by the community due to the oil spillage.

It has been sufficiently demonstrated that the constituents of crude oil and by-products of its metabolites and pollution are carcinogenic (Weisburger and Williams 1980). John, W. B et al 1996 further corroborated the earlier assertion of Weisburger and Williams when he demonstrated the genotoxic effects of petroleum crude oil following chronic exposure to menks. Kalf G. F. et al also demonstrated the genotoxic effect of Benzene Arene oxide, a putative metabolite of Benzene a component of crude oil. In 2006, we analyzed the occurrence of cancers and other tumours in Rivers and Bayelsa States. About 362 cancer cases were reported and treated at the UPTH between December 1997 and December 2000. Analysis of the data showed that 186 of these cases came from Bayelsa State, 154 from Rivers State and 22 cases from Abia, Akwa Ibom, Imo and Cross Rivers States indigenes who were resident in Port Harcourt. Out of 362 reported cases, carcinomas of the reproductive system were 251, liver 53, GIT 40 and others were leukemia and lung cancer 18.

The communities most affected were those in Bayelsa State, Etche, Ogoni, Port Harcourt and to a lesser extent Kalabari, Okrika and

Opobo in Rivers State. Correlation analysis showed that the incidence of cancer in these communities correlated positively with oil exploration and polluting activities. The findings of our various research efforts over the years strongly justify the urgent need for prompt scientific treatment of crude oil spillages wherever or whenever it occurs and the establishment of a Cancer Institute in the Niger Delta to tackle this debilitating illness. This work was published in a Peer Reviewed Indexed Journal.

TABLE 5: OCCURRENCE OF CANCER AND OTHER TUMOURS IN RIVERS AND BAYELSA STATES, NIGERIA, FROM DEC. 1997-DEC. 2000.

	BAYELSA	RIVERS	OTHER STATES	TOTAL
MALE	15.75%(57)	12.43%(45)	2.00%(6)	30.18%(108)
FEMALE	35.64%(129)	30.11%(109)	4.00%(16)	69.75%(254)
TOTAL	51.38%(186)	42.54%(154)	6.00%(22)	100%(362)

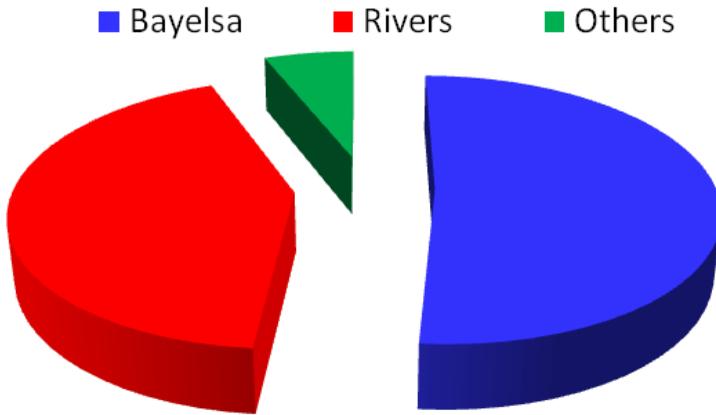


Figure 9: Occurrence of Cancer and other tumours in Bayelsa, Rivers and other states

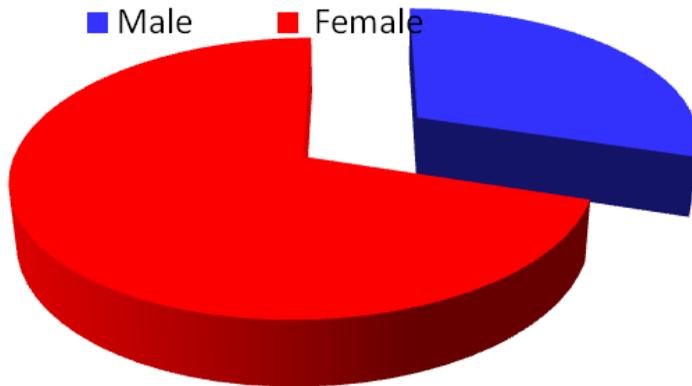


Figure 10: Occurrence of Cancer and other tumours in Bayelsa, Rivers and other states

TABLE 6: TYPES OF CARCINOMA POPULATIONS IN RIVERS AND BAYELSA STATES, NIGERIA

	BAYELSA	RIVERS	OTHERS	TOTAL
Ca reproductive system	124	113	14	251
Ca Liver	32	18	3	53
Ca GIT	22	14	4	40
Other Ca	8	9	1	18
Total	186	154	22	362

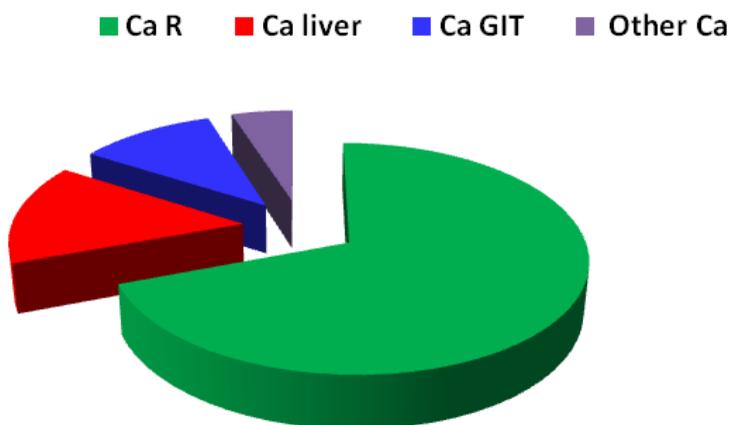


Figure 11: Types of carcinomas

These findings of strong correlation between the occurrence of carcinomas and oil exploration and production activities were further confirmed in our laboratory using the Ames test. The growth of *Salmonella typhimurium* in a culture of liver cells and crude oil is indicative of the mutagenic effect of crude oil. Under normal circumstances, *Salmonella typhimurium* does not grow in a culture of liver cells, however if a chemical that is capable of

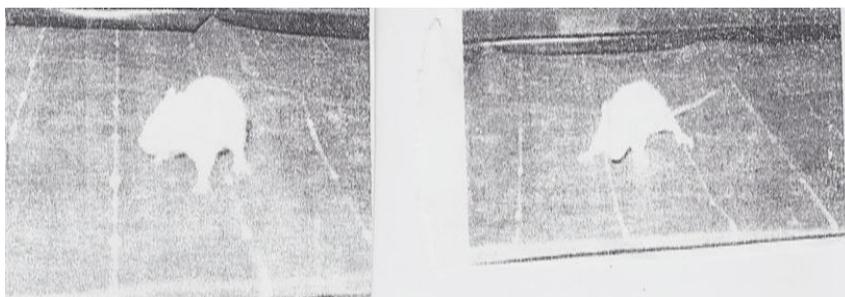
causing mutation in the micro-organism is added to the culture containing liver cells and Salmonella typhimurium, the organism grows as a result of the mutation. Crude oil caused the needed mutation for the organism to grow.

Darenbach et al 1980, Rinkevich and Lova 1979, Rossi and Anderson 1977, Hawkes and Stear 1982, had all in their various works reported the delayed toxic effects of crude oil, stating postulates such as impairment of gonadal development by crude oil leading to increased incidence of developmental abnormalities.

We further investigated the chronic exposure of crude oil on pregnancy. Pregnant female rats were chronically exposed to crude oil polluted food and water and observations were made on the progression of the pregnancy and delivery of young pups. Whereas, the control group pregnant rats that received unpolluted food and water went through the pregnancy and delivered healthy young pups; the findings among the test group pregnant rats were startling. There were induced abortions as 40% of the pregnant rats lost the pregnancy, the 60% that carried the pregnancy to gestation delivered young pups, but most intriguing was the fact that 5 out of the 7 young pups delivered were eaten by the mother rats. The mother rats were mated with male rats again leading to a second pregnancy, the second pregnancy were all carried successfully but the manifestation of delayed toxic effect of crude oil became more apparent as the young pups delivered were all undersized about $\frac{3}{4}$ the size of the pups born to the control group rats. 70% of these rats died in less than 24 hours. This carnivorous behaviour of the mother rats may possibly be due to interference

with the behavioural function of the brain and may in part explain some of the psycho-sociological challenges facing the Niger Delta.

The high number of deaths among the new born correlate strongly with the high under five mortality rate (U5MR)- a critical indicator of the well being of children and the level of national development (Nte et al 1997).



Picture 6: On the left is the picture showing normal size new born rat of control group, while the picture on the right shows undersize (3/4) new born rat to mother rats exposed to crude oil

CRUDE OIL TOXICITIES: MITIGATING THE EFFECTS

In 2004, having extensively studied and documented the various toxic effects of crude oil, the supervisor of my Doctorate Degree Research, my teacher and my mentor Prof. R. N. P. Nwankwoala, threw two challenges at me;

1. These effects we have observed, are they reversible?
2. Is it possible to mitigate or ameliorate these toxic effects of crude oil?

Prompt removal of the spilled crude oil is known as one of the most appropriate safety measures available to safeguard the health of the inhabitants of the Niger Delta. In order to assess the effect of prompt removal on the toxic effect of crude oil, a reversibility study was designed. The protocols adopted, in this study was a modification of the protocol for the studies on crude oil toxicity.

In this study design, crude oil exposure was terminated after two weeks of exposure of the test group animals to crude oil. Unpolluted food and water replaced polluted food and water after two weeks of exposure to crude oil. The result of this reversibility study showed that the effect of exposure of rat to Nigerian crude oil such as weight loss, loss of appetite, weakness, abortions, infertility and altered psycho-social behaviours were all reversed - the rats regained weight, regained appetite, became active, achieved pregnancy and gave birth to healthy young pups. This work was published in a Peer Reviewed Indexed Journal.

TABLE 7: REVERSIBLE EFFECTS OF PROLONGED EXPOSURE OF RATS TO NIGERIAN CRUDE OIL

Parameter Measured	Day 1		Day 7		Day 14 Test group rats now on unpolluted feed		Day 21		Day 28	
	C	T	C	T	C	T	C	T	C	T
Weight (gm)	200± 2.00	210± 2.00	215± 1.00	170± 1.00	220± 2.00	135± 2.00	230± 1.00	180± 2.00	235± 2.00	220± 1.00
Appetite	+4	+4	+4	+2	+4	+1	+4	+2	+4	+3
Weakness	+4	+4	+4	+2	+4	+1	+4	+2	+4	+3
Pregnancy	YES	YES	YES	YES	Yes	Nil	Yes	Nil	Yes	Nil

$P \leq 0.01$ as compared to the control values

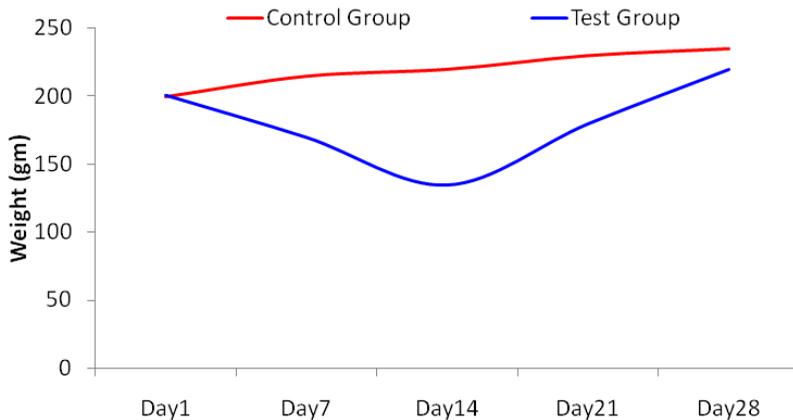


Figure 12: Reversible effect of prolonged exposure of rats to Nigerian Crude Oil on weight

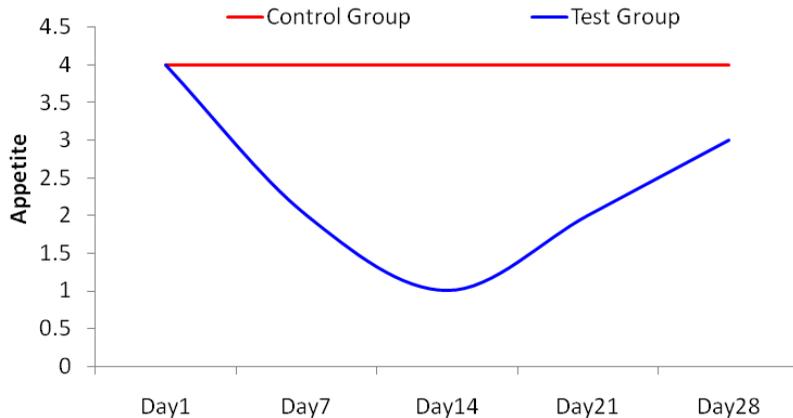


Figure 13: Reversible effect of prolonged exposure of rats to Nigerian Crude Oil on appetite

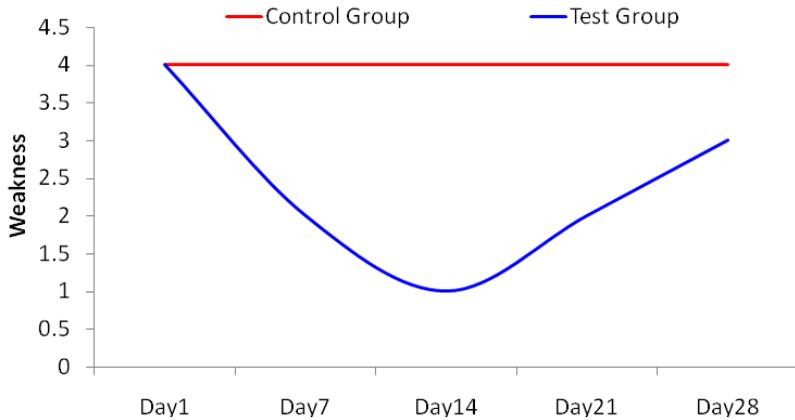


Figure 14: Reversible effect of prolonged exposure of rats to Nigerian Crude Oil on weakness

This report buttresses the need for prompt clean up of spilled crude oil. No two spills are the same because of the variation in oil types, locations and weather conditions involved. However, broadly speaking, there are four main methods of response;

1. Leave the oil to disperse by natural means, if there is no possibility of the oil polluting coastal regions or marine industries.
2. Contain the oil spill with booms and collect it from the water surface using skimmer equipments.
3. Use dispersants to break up the oil and speed up its natural bio-degradation.
4. Bioremediation involving the introduction of biological agents to the spills to hasten bio-degradation.

These procedures if applied promptly will terminate the exposure of the human inhabitants to the crude oil and allow for reversal of the toxic effects of the crude oil on the human subject.

MECHANISM OF CRUDE OIL TOXICITY

Exposure to various environmental factors, including crude oil pollution and radiation leads to the formation of free radicals. In humans, the most common form of free radicals is highly reactive oxygen species. Free radical induced cellular damage, thus appears to be the main mechanism of toxicity following exposure to crude oil (Ramanathan et al 2002). These highly reactive free oxygen radicals might have caused oxidative stress on deoxyribonucleic acids, proteins, enzymes and cellular macrophages causing cellular toxicity and leading to mutagenesis, cellular distortion and destructions.

ANTIOXIDANTS: ALPHA TOCOPHEROL (VITAMIN E), BETA CAROTENE (VITAMIN A) AND LYCOPENE

Antioxidants are substances that may protect cells from the damage caused by chemicals (oxidatives) reactions of free radicals. Antioxidants reduce free radical mediated oxidative stress induced by elements and compounds in the environment (Ramanatha et al 2002). Antioxidants interact with and stabilize free radicals. Examples of antioxidants include alpha tocopherol (vitamin E), beta carotene (vitamin A) and lycopene (Robert 1993).

Ameliorating or mitigating the toxic effects of crude oil exposure would therefore require the search for agents capable of neutralizing the damaging effects of the released free radicals. The

effect of alpha tocopherol, a potent antioxidant in mitigating, preventing or ameliorating the varied toxic effects of crude oil was investigated. This is the first attempt of any centre at providing a remedy for this environmental, health, psycho-social challenge posed by crude oil toxicities.

In this study protocol, modifications introduced include the following;

1. Test group rats exposed to crude oil also received appropriate doses of alpha tocopherol.
2. Test group rats exposed to crude oil but did not receive alpha tocopherol
3. Control group rats that received unpolluted food and water throughout the duration of the study.

The results of this study showed that the test group animals that were exposed to crude oil but did not receive alpha tocopherol, exhibited all the features of earlier reported toxicities such as significant weight loss, reduction in appetite, weakness, infertility and multiple organ pathology. However, in the test group rats that were exposed to crude oil and also received alpha tocopherol, the agent alpha tocopherol interacted with the free radicals generated by the crude oil and protected the rats from the deleterious effects of crude oil. The rats gained weight, appetite, and were active. FSH, LH, estrogen and progesterone levels increased steadily as in the control group rats. Pregnancies were achieved and healthy young pups delivered. The organs of rats in this group revealed normal cellular architecture.

TABLE 8: PROTECTIVE EFFECTS OF ALPHA TOCOPHEROL ON RATS EXPOSED TO CRUDE OIL.

Parameter Measured	Day 1		Day 7		Day 14		Day 21		Day 28	
	C	T	C	T	C	T	C	T	C	T
Weight (gm)	200± 2.00	205± 2.00	215± 1.00	207± 1.00	220± 2.00	210± 2.00	230± 1.00	215± 2.00	235± 2.00	220± 1.00
LH(iu/l)	-	-	2.10 ± 0.01	2.08 ± 0.01	2.24 ± 0.01	2.10 ± 0.01	2.30 ± 0.01	2.28 ± 0.01	2.35 ± 0.01	2.30 ± 0.01
FSH(iu/l)	-	-	1.60 ± 0.01	1.55 ± 0.01	1.70 ± 0.01	1.58 ± 0.01	1.80 ± 0.01	1.65 ± 0.01	1.85 ± 0.01	1.70 ± 0.01
Estrogen (iu/l)	-	-	0.50 ± 0.01	0.40 ± 0.01	0.60 ± 0.01	0.45 ± 0.01	0.65 ± 0.01	0.50 ± 0.01	0.70 ± 0.01	0.55 ± 0.01
Progessterone (nmol/l)	-	-	0.80 ± 0.01	0.60 ± 0.01	0.85 ± 0.01	0.65 ± 0.01	0.90 ± 0.01	0.70 ± 0.01	0.95 ± 0.01	0.80 ± 0.01

P≤0.05 as compared to control values.

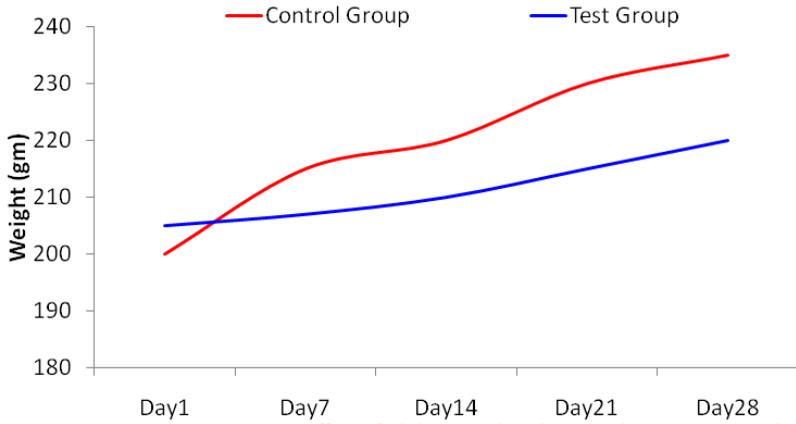


Figure 15: Protective effect of Alpha Tocopherol on weight in rats exposed to Crude Oil

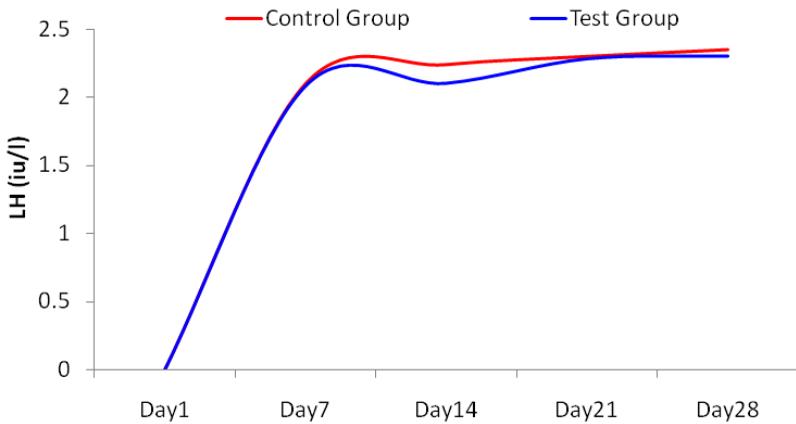


Figure 16: Protective effect of Alpha Tocopherol on LH in rats exposed to Crude Oil

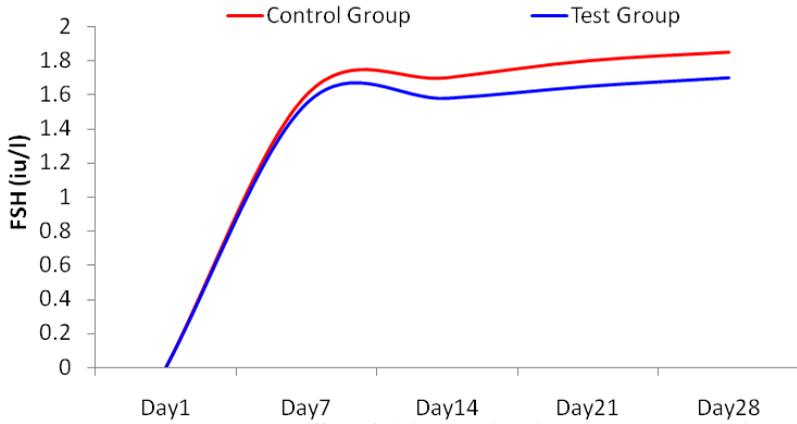


Figure 17: Protective effect of Alpha Tocopherol on FSH in rats exposed to Crude Oil

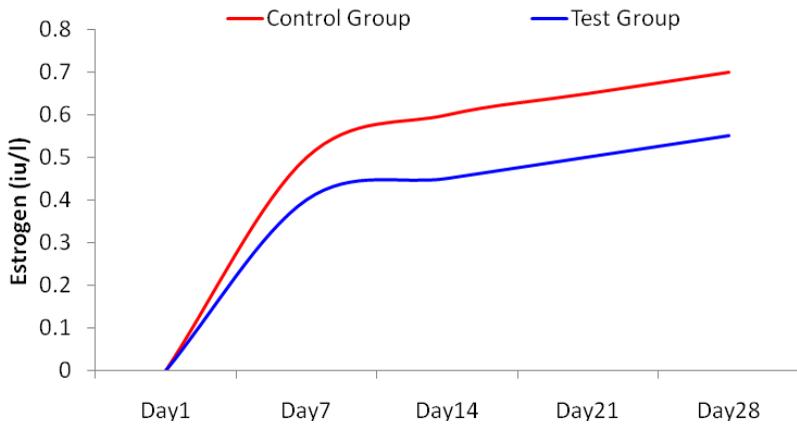


Figure 18: Protective effect of Alpha Tocopherol on estrogen in rats exposed to Crude Oil

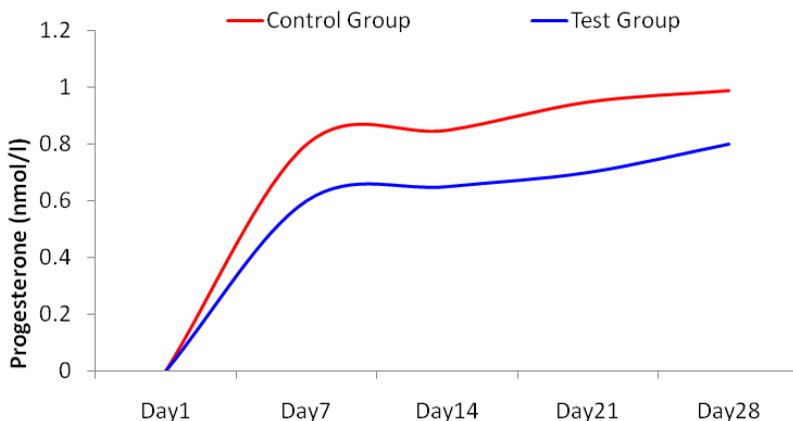


Figure 19: Protective effect of Alpha Tocopherol on progesterone in rats exposed to Crude Oil

TABLE 9: SUMMARY OF THE PROTECTIVE EFFECTS OF ALPHA TOCOPHEROL ON THE HISTOPATHOLOGY OF VARIOUS ORGANS IN RATS EXPOSED TO CRUDE OIL

ORGAN	EFFECTS
TESTIS	Normal cellular architecture
HEART	Normal cellular architecture
LUNGS	Normal cellular architecture
KIDNEYS	Normal cellular architecture
LIVER	Normal cellular architecture

Regular vitamins supplementation in line with our findings, will strongly protect, ameliorate and mitigate the varied effects of crude oil in inhabitants of areas prone to constant crude oil spillages.

Vice-Chancellor Sir, in my interview for elevation to the rank of a Professor of Pharmacology, I posited that, the establishment of a Centre for Niger Delta Studies was long overdue and is of utmost need, to collaborate multidisciplinary studies on issues that affect the Niger Delta be it crude oil toxicities, social, psycho-social, educational, youth development amongst others. It gladdens my heart that this Unique Entrepreneurial University today has a Centre for Niger Delta Studies.

In the early period of my research activity, I had a passion for Ethno-pharmacology, probably because as a growing child in my community, I had seen leaves of plants, stems, barks, roots and seeds being used for the treatment of various ailments and the tremendous relief to patients. I also saw how on different occasions some patients reacted or developed severe side effects probably because of the unspecified dose administered or the presence of many impurities in these preparations.

I investigated several plant extracts with a view to identifying the active ingredients in such plants for possible development as drugs that could meet the scientific definition of a drug. I studied the anti-inflammatory effects of *Pseudocedryla kotchi*, a plant widely used by traditional practitioners for the treatment of various diseases such as epilepsy, rheumatism, and diarrhea and for pain relief. My findings justified the claim for the use of this plant.

I studied the anti-diabetic effect of leaf extracts of *Vernonia amygdalina* (Bitter leaf), a shrub that has been used in folk

medicine for the treatment of malaria, eczema and the relief of fever. The findings of this study corroborated the report of the use of the shrub for maintaining blood sugar concentration and provide an opportunity for the development of a novel class anti-diabetic agent. Other plants I have investigated includes; *Abrus precatorious*, *Cannabis sativa*, *Papaver somniferum*, *Moringa olifera*, *kola nitida*, *Mucaina pruriens* amongst others. Reports from all these investigations have been published in Peer Reviewed Indexed Journals.

We demonstrated histopathological alteration of the cerebral cortex of brain of rats exposed chronically to *Cannabis sativa* (marijuana), possibly explaining the underlying defect in *Cannabis* induced psycho-social challenges.

Using croton oil induced inflammatory response model of Tonelli, we investigated the anti-inflammatory activity of extracts of the following plants; *Vernonia amydalina*, *Abrus precatorious* and *Pseudocedryla kotchi* and reported significant anti-inflammatory activity of these extract, justifying their use in the treatment of various inflammatory disease conditions. Attempts are on to isolate the active principles in these extracts for further development.

Rheumatoid arthritis is a chronic autoimmune disease in which there is inflammation of joints, synovial proliferation and destruction of articular cartilage. Current treatment options are plagued with much adverse effects. We investigated the anti-rheumatic effects of extracts of *Vernonia amydalina* and *Abrus*

precatorious. Croton oil was injected into the sub-planter region of the left hind paw of laboratory rats. Treatment of these rats with the extracts significantly inhibited the inflammatory reaction by reducing the paw size when compared to the paw size of control untreated rats. The order of ranking was *Vernonia amydalina* > *Abrus precatorious*. Further investigations are ongoing in our laboratory to assess the toxic effects of these extracts with a view to determining how safe these extracts are despite their effectiveness.

From 2000, on the prompting of my mentor, teacher and supervisor my focus of research changed to toxicology, hence the presentation of this Inaugural Lecture in my current area of focus-Toxicology. The search for novel agent or agents for the total amelioration or mitigation of the varied toxic effects of chronic exposure to crude oil is still on and I intend to continue the search in my future research endeavours.

RECOMMENDATIONS

1. Establishment of a cancer institute in the Niger Delta Region preferably in Bayelsa State.
2. Establishment of a regional centre for Niger Delta studies sponsored by the South-South States.
3. Federal government should ensure adequate provision of basic amenities for health care, education, transportation, wealth creation and recreation in the Niger Delta region.

4. Federal government should ensure proper implementation of environmental laws to protect the environment.
5. Federal government should ensure enforcement of the deadline for ending of all gas flaring in Nigeria by the end of December 2012 as contained in the Petroleum Industry Bill (PIB).
6. Sustain research efforts in various departments through the creation of an enabling research friendly environment in the university.
7. South-South States should create oil mineral area producing commissions in their respective states to adequately address the problems of this region.

CONCLUSION

Let me once again thank the Vice Chancellor for giving me the opportunity to present this Inaugural Lecture. The establishment of the centre for Niger Delta studies in this university is indeed a step in the right direction and is highly commendable. The issues concerning crude oil exploration, national development, environmental degradation and crude oil toxicity are very important issues as they affect the survival of the nation, survival of the Niger Delta region and its inhabitants. While crude oil exploration and production is good as it sustains our national economy, as the federal, state and local government share the monthly allocation, the survival of the Niger Delta region and its inhabitants must also be of utmost concern as the nation strives to provide adequate infrastructure and social amenities, enforce strict environmental laws, support research efforts in the Niger Delta, end gas flaring, replace old and corroded pipelines amongst other activities in order to strike a balance between the gains of crude oil exploration and production and the pains of the environmental degradation of the Niger Delta region.

As I return to my seat, let me kindly plead with you all to join me and sing the song written by I. Watts and composed by St. Anne 1708:

1. O God, our help in ages past
Our hope for years to come
Our Shelter from the stormy blast
And our eternal home

2. Beneath the shadow of thy throne
Thy saints have dwelt secure
Sufficient is thine arm alone
And our defence is SURE
3. O God our help in ages past
Our hope for years to come
Be thou our guard while troubles last
And our eternal home

and H. Bonar's 1911

Not mine, not mine, the choice
In things or great or small
Be thou my guide, my strength
My wisdom and my ALL

Thank you

REFERENCES

- Baird, J., (2010): "Oils shame in Africa" Newsweek
- Chike, C.P.R., **Georgewill, O.A.** and Nnodi, C.U.,: 'Effect of aqueous leaf extract of *vernonia amygdalina*(bitter leaf) on blood glucose concentration of alloxan induced diabetic albino wistar rats' Published in African Journal of Applied Zoology and Environmental Biology, 2006. Vol.8:44-47
- David, S.L. and Georse, M.S., (2009); Estrogens and Progestins. In Hardman J.G. and Limbird L.E;(eds) In Goodman and Gilman's; the pharmacological basis of therapeutics. McGraw Hill publication pp1597-1634.
- Deranbach, J.B. and Greek, M.V., (1980): "Interference of petroleum hydrocarbons with sex pheromone reaction of *F. Vesiculosus*. J. Exp. Mar. Biol. Ecol. 44:61-65
- Ezejiolor, N.A., Orish, C.N., **Georgewill, O.A.**, Onyiorah, V.I. and Orisakwe, O.E.,: 'Hepatotoxic and Hematologic effects of an aqueous extract of the Nigerian herbal remedy U & D Sweet bitter in male albino rats' Published in Journal of Basic and Clinical Physiology and Pharmacology, 2009, 20(2): 179-186.
- Egbogah E.(2006): "50 years of oil production in Nigeria." Port Harcourt Institute of Petroleum studies monograph No.2. amethyst and colleagues publishers P3.
- Georgewill, O.A.** and Georgewill, U.O.,: 'Antiarthritic activity of *Vernonia amygdalina* in albino rats' Published in Asian Pacific Journal of Tropical Medicine 2009;2(5):58-60

- Genova, A. and Toyin, F.,(2003): Oil in Nigeria; A bibliographical Reconnaissance History in Africa. Vol 30 pp133-156
- Georgewill, O.A.** and Nwankwoala, R.N.P.,: 'The effects of prolonged exposure of Nigerian crude oil reproductive hormones of rats' Published in African Journal of Applied Zoology and Environmental Biology, 2006. Vol.8:16-19
- Georgewill, O.A.** and Nwankwoala, R.N.P.,: 'Reversible effects of prolonged exposure of rats to Nigerian light crude oil' Published in Journal of Nigerian Env. Soc., 2004, Vol. 2 No. 1:70-76
- Georgewill, O.A.** and Chike, P.C.,:'The antiphlogistic potencies of extract of *Pseudocedryla kotchi*' Published in African Journal of Applied Zoology and Environmental Biology, 2003. Vol.5:55-57
- Georgewill, O.A.** and Georgewill, U.O.,: 'Effect of extract of *abrus precatorious* on blood glucose concentration of alloxan induced diabetic albino wistar rats' Published in Asian Pacific Journal of Tropical Medicine 2009;2(6):16-17
- Georgewill, U.O. and **Georgewill, O.A.**,: 'Antiarthritic activity of *Abrus precatorious* in albino rats' Published in Journal of Pharmaceutical and Allied Sciences, 2009, 6(3):633-637
- Georgewill, O.A.** and Nwankwoala, R.N.P.,: 'The effects of prolonged exposure of Nigerian crude oil on reproductive hormones of guinea pigs' Published in African Journal of Applied Zoology and Environmental Biology, 2006. Vol.8:30-33
- Georgewill, U.O., **Georgewill, O.A.** and Nwankwoala, R.N.P.,: 'A study of the histaminic activity of extract of *mucaina*

pruriens' Published in Journal of Pharmaceutical and Allied Sciences, 2009, 6(4):765-771

Georgewill, U.O., **Georgewill, O.A.**, : 'Effect of leaf extract of *pseudocedryla kotchi* on blood glucose concentration of alloxan induced diabetic albino wistar rats' Published in Journal of Pharmaceutical and Allied Sciences, 2008, 5(2):614-617

Georgewill, O.A., Georgewill, U.O. and Nwankwoala, R.N.P.,: 'Antiinflammatory activity of a new pyrazolon drug' published in: The Intern. Journal of Pharmacology, USA, 2009, Vol. 7, No. 1

Georgewill, U.O. and **Georgewill, O.A.**,: 'Antiarthritic activity of *Abrus precatorious* in albino rats' Published in Journal of Pharmaceutical and Allied Sciences, 2008, 5(2):707-711

Georgewill, O.A. and Nwankwoala, R.N.P.,: 'Interaction of crude oil with alpha-tocopherol: Protection of crude oil lethal effects on weights and reproductive hormones through anti-oxidation' Published in African Journal of Applied Zoology and Environmental Biology, 2008. Vol.10:65-69

Georgewill, O.A. and Nwankwoala, R.N.P.,: 'Interaction of crude oil with alpha-tocopherol: Protection of crude oil lethal effects on the histology of the liver, lungs, heart and kidney through anti-oxidation' Published in African Journal of Applied Zoology and Environmental Biology, 2008. Vol.10:50-55

Georgewill, U.O. and **Georgewill, O.A.**,: 'Evaluation of the anti-inflammatory activity of extract of *Vernonia amygdalina*'

Published in Eastern Journal of Medicine, Turkey. 2009,
14(1):20-22

Georgewill, O.A. and Nwankwoala, R.N.P.,: ‘Interaction of crude oil with alpha-tocopherol: Protection of crude oil lethal effects on delayed toxicity of rats through anti-oxidation’
Published in African Journal of Applied Zoology and Environmental Biology, 2008. Vol.10:32-35

Georgewill, O.A. and Georgewill, U.O.,: ‘Evaluation of the anti-inflammatory activity of extract of *Abrus precatorious*’
Published in Eastern Journal of Medicine, Turkey. 2009,
14(1):23-25

Gbadebo, O.O., (2008): “Crude oil and the Nigerian Economic performance”. Oil and gas business forum.

Hawkes, J.M. and Stehr, C.M.,(1982): Cytopathology of the brain and retina of embryonic surf smelt exposed to crude oil. Environ, Res. 27:164-178.

Jerina, D.M. and Lehr, R.E;(1997): the bay region theory: A quantum mechanical approach to aromatic hydrocarbons induced carcinogenicity.In “microsomes and drug oxidations”. Pergman Press, oxford. Pp 709-720

Kalf, G.F. Post, G.B. and Snyder, R., (1987): Solvent Toxicology: in recent advances in the toxicology of benzene, the xycol ethers and carbon tetrachloride, Annu. Rev. Pharmacol, Toxicol;27,399-427.

Loomis, T. A., (1978): “Toxicology Testing methods” In Essentials of Toxicology (3rd ed.). Lea and Febiger, Philadelphia, pp 195-237.

- Moons, D.S., Parlow, A.F. and Kiyoo K.H., (2002): "Pituitary hypoplasia and autotrough dysfunction in mice deficient for cyclase-dependent kinase-4; *Endocrinology* 143(80):3001-3008.
- Madujibeya, S.A.,(1976): "Oil and Nigeria's economic development". *African Affairs* vol 75 No 300 pp 284-316.
- Nte, A. R., Oruamabo, R.S. and Nkanginieme, K.E.O. (1997): "Sociodemographic factors associated with tetanus toxoid acceptance by pregnant women in a Piverine community" *The Nigerian Postgraduate Medical Journal* 4(3):80-83.
- Ogbonna G.N. and Appah E.(2012): Petroleum income and Nigerian economy: Empirical evidence: *Arabian Journal of Business and management Review*. Vol 1 No. 9. 2012.
- Ramanathan, K., Balakumar, B.S. and Panner S.C., (2002): "Effects of ascorbic acid and alphanatocopherol on arsenic-induced oxidative stress. *Hum. Exp. Toxicol.* 21(12):675-680.
- Robert, K., Murray, D.K., Granner, P.A. and Rodwell, V.W., (1993): *Happer's Biochemistry*, 23rd Ed. Lary Medical Publishers
- Rossi, S.S. and Anderson, J.W., (1977): "Accumulation and release of fuel oil derived aromatic hydrocarbons to the polychaete. *Mar. Biol.* 39:51-55.
- Rinkevich, B. and Loya, Y., (1979): "Laboratory experiments on the effects of crude oil on the red sea coral. *Mar. Pollut. Bull.* 10:328-330.
- Snyder, B., Lea, E.W.M Kecsis, J. J. and Witmer, C.M., (1977): Bone marrow depressant and leukemogenic action of benzene. *Life Sciences*, 21: 1709-1722.
- Truscott, B.J., Walsh. M.P., Payne, J.F and Idler, D.R., (1985): "Effects of Acute exposure to crude oil on some

- reproductive hormone in Salmon and Flounder. *Comp. Biochem, Physiol.*, 75c: 121-130.
- Vassihou Marius(2009): “Historical dictionary of Petroleum Industry” Scarecrow Publishers.
- Weisburger, J.H. and Williams, G.M., (1980): “Chemical carcinogens” In ; Casaret and Doull’s *Toxicology, the basis of poisons*. 2nd Ed. Macmillan Publishing Co. New York, pp 84-138
- Ziworitin, B., **Georgewill, O.A.** and Nwankwoala, R.N.P.,: ‘Histopathological effects of Nigerian crude oil on rats’ Published in *African Journal of Applied Zoology and Environmental Biology*, 2006. Vol.8:73-79

CITATION ON

PROFESSOR OWUNARI ABRAHAM GEORGEWILL B.Med. Sc., MBBS., MSc., MD., UPH



Professor Owunari Abraham Georgewill was born on 15th May, 1965 in Abonnema in Akuku-Toru Local Government Area of Rivers State, Nigeria, with his twin sibling, Hon. Justice Biobele Abraham Georgewill. He lost his father Mr. Abraham O. Georgewill thereafter at age one. His mother, Mrs. Ineyi Abraham Georgewill and maternal grandmother, Mrs. Laura Monday Oribu both of blessed memory were solely responsible after the death of his father for the entire upbringing of the little twins, a task they discharged very creditably.

He attended Bishop Crowder Memorial School, Abonnema between 1970 and 1976 and obtained a credit pass in the First Leaving School Certificate Examination. He then proceeded to the Nyemoni Grammar School also in Abonnema where he obtained his G.C.E “O” Level certificate in 1981 in flying colours. His quest

for higher education, took him to the University of Port Harcourt to study Medicine. In 1987, he graduated with Second Class Honours Upper Division B.Med. Sc. degree in Pharmacology. His diligence and hardworking nature earned him the nickname “Prof” as early as his second year of undergraduate study. In 1990, he obtained the MBBS degree of the University of Port Harcourt.

He did his housemanship at the University of Port Harcourt Teaching Hospital before proceeding to Edo State for his one year National Youth Service as Medical Officer at the Specialist Hospital, Ossiomo. In 1993, he commenced residency training as a Registrar in the Department of Internal Medicine, UPTH. In 1994, his teacher and mentor, Professor Reginald Nwairegbu Pawa Nwankwoala of blessed memory, searched for him, found him and said to him “Georgewill, your future is in Pharmacology, don’t waste your time elsewhere”. He immediately obeyed his teacher, applied and was employed as a Lecturer II in Pharmacology after a successful interview.

He rose through the ranks and was promoted to the rank of a Professor of Pharmacology on May, 4, 2010 at age 44. He also holds the MSc degree in Pharmacology and the MD degree of the University of Port Harcourt. Professor Owunari Georgewill has served the Department of Pharmacology, the Faculty of Basic Medical Sciences, the College of Health Sciences and the University of Port Harcourt in various capacities.

He was examination Officer in the Department of Pharmacology from 1994-1998 and 2003-2005. He supervises undergraduate and

postgraduate students of the Department. He served as Acting Head of Department, Pharmacology between 2006 and 2008. He served as Associate Dean of Students Affairs Between 2000 and 2005. He served as member- Hostel Maintenance Committee, Students welfare committee, medical Officer, Team Uniport, Deputy Team Leader Team Uniport at WAUG in Kumasi, Ghana and Quaquadugo, Burkina Faso. He served as Board Chairman UDPS Governing Board between 2008 and 2011. In all these positions, he discharged his duties creditably to the admiration of the appointing authorities.

Professor Owunari Georgewill has also served his community Abonnema, his State, Rivers State, his Professional Associations- Nigeria Medical Association and the West African Society of Pharmacology in various capacities. He was appointed Justice of Peace by the Rivers State Government in 2002. He has served as Assistant Secretary General NMA, R/S, Editorial Board member, Journal of the WASP, Secretary, Board of Governors, Comprehensive Secondary School, Abonnema, and Executive Adviser on Health, AKULGA. He is a reviewer of Pharmacology articles for many journals. He is currently a member of the Editorial Board of the Asian-Pacific Journal of Tropical Medicine.

In 2010, Professor Owunari Georgewill was appointed Dean, Faculty of Basic Medical Sciences, Niger Delta University, where he served creditably during his tour of duty there. In February, 2012, he was elected, Deputy Provost, College of Health Sciences of this University.

On the National arena, Professor Owunari Georgewill, served as Chairman, Syndicate session on UBE in National Education Summit, organized by the Senate of the Federal Republic of Nigeria in Abuja in 2008. He served as member of Technical Committee for the Senate Committee on Education between 2008 and 2009. He was a Resource Person at the National Education Conference organized by the Senate Committee on Education in conjunction with SIGNIP promotions in Abuja in March 2010. He is a Fellow of the Institute of Industrial Administration of Nigeria.

In 2005, working together with his teacher and mentor Prof. R. N. P. Nwakwoala, he provided empirical scientific evidence through various research on crude oil toxicities to support the petition of Gbanraun Community against Shell PDC before the Senate Committee on Public Petitions, that led to the award of \$2billion to the petitioners by the Committee.

Professor Owunari Georgewill's engagement in research activity began in 1987 and has culminated in the writing of a textbook in Pharmacology: "Reasoning in Drug Biology", and contribution of Chapters to text books on Pharmacology. He has over 40 original articles in Peer Reviewed, Local, Regional and Foreign indexed Journals. He has over 10 abstracts, published in conference proceedings.

Professor Owunari Georgewill is happily married to his lovely wife Dr. (Mrs.) Udeme O. Georgewill, a lecturer also in the Department of Pharmacology. He has 4 children, Barrister Melford, Miss Tamunoemi, Miss Tamunodein and Miss Tamunobakam. He loves

his wife, his twin sibling Hon. Justice Biobele A. Georgewill and his children dearly.

He is a devout Christian of the Anglican Communion. He is a licensed lay reader and a Knight of St. Christopher. In 2009, in recognition of his invaluable services to his community, he was installed a Chief in the Otaji group of houses of Abonnema Council of Chiefs.

Vice-Chancellor Sir, ladies and gentlemen, I present to you, Professor Owunari Abraham Georgewill, an erudite scholar, an academic colossus, an achiever per excellence, a Knight of St. Christopher, a lover of God, a loving husband of Udeme, a doting father of four, a Justice of Peace, a traditional ruler, a Pharmacologist, a toxicologist per excellence, a politician, a great and unique set of twin, a humble and unassuming academic, to deliver the inaugural lecture of the University of Port Harcourt.

Professor Iyeopu Minakiri Siminialayi
13th September, 2012.