UNIVERSITY OF PORT HARCOURT

THAT IT MAY BE WELL WITH US: FOOD AS MEDICINE AND POISON

An Inaugural Lecture

By

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DEDICATION

To the two most important women in life, my mother, Mrs Dinah Ine Siminialayi and my wife Tonbra Theresa Siminialayi.

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OUTLINE

Introduction
Definitions and explanation of terms
Evolution of the human diet
Comparison of Paleolithic and modern western and African diets
Evidence that food can be medicine
Is it reasonable to adopt the paleolithic or other functional diets?
How is food harmful?
What should we eat?
How much should we eat?
Recommendations

THAT IT MAY BE WELL WITH US: FOOD AS MEDICINE AND POISON

Introduction

The topic for this lecture has been inspired by the words contained in Ephesians 6:2 & 3; "honour thy father and mother; (which is the first commandment with promise); that it may be well with thee; and thou mayest live long on the earth." Vice chancellor sir, I hope I have honoured my mother (I lost my father when I was only one year old) and my all uncles who helped raise me so that it may continue to be well with me as the Bible has promised but this is not about honour and parents. I have found in my career as an academic that eating the right quality and quantity of food holds a similar promise; freedom from non-communicable disease and length of days. Food as medicine is a burgeoning field of medicine that is called nutritional pharmacology.

The subject of my inaugural lecture is informed by the fact that presently, an adult Nigerian is more likely to die from a non-communicable disease (NCD) than from a communicable disease. According to the World Health Organisation (WHO), in 2008, approximately 80% of NCD deaths occurred in low and middle income countries (WHO 2011), a very steep rise from just under 40% in 1990 (Murray and Lopez, 1999). NCDs account for 48% of the healthy life years lost (Disability adjusted life years — DALYs) worldwide versus 40% for communicable diseases, maternal and perinatal conditions and nutritional deficiencies, and 1% for injuries (WHO 2005). As opposed to communicable diseases, non-communicable diseases (NCDs) are those diseases that are not contagious. That is, they cannot be transmitted from one person to another.

These conditions which are chronic (cause a protracted period of impaired health), cause dysfunction or diminution of the quality of life and develop over relatively long periods of time. They usually persist for the life-time of the person affected and so place huge demands on the individual's resources and that of the health system.

It is estimated that over the next 20 years, NCDs will cost more than US$ 30 trillion, representing 48% of global GDP in that time, and push millions of people below the poverty line (Bloom *et al*., 2011). There is however increasing evidence to suggest that NCDs can be prevented, and so millions of deaths can be avoided and a reduction of economic losses by billions of dollars made, if we pay extra attention to preventive measures such as healthy eating habits. It will also not cost much to do this. In a recent report, the World Health Organization states that interventions promoting population-based life-style adjustment measures geared towards a reduction in tobacco and harmful alcohol use, unhealthy eating habits, together with an improvement in physical inactivity, will cost an estimated US$ 2 billion per year for all low- and middle-income countries, or the equivalent of less than US$ 0.40 per person (Bloom *et al*., 2011).

Vice Chancellor Sir, as Dr. Mehmet Oz, professor of surgery at Columbia University Medical Centre, New York City and one of the most popular medical program presenters on television puts it, "people have to understand that when they walk into a grocery store, they are walking into a pharmacy and the power of those foods is as powerful as medications." That is my assignment today. I am convinced that the consumption of healthy

food will ensure that it is "well with us", so that "we may live long on earth."

Let me begin with some definitions and explanation of terms.

Food is defined simply as any substance that can be metabolised by an animal to give energy and build tissue. It is divided into macronutrients and micronutrients. Macronutrients are the classes of chemical compounds humans consume in largest quantities and which provide bulk energy. These are fat, protein and carbohydrate. Micronutrients are substances needed only in small quantities for normal body function and include vitamins and minerals.

Processed food is made from harvested crops or butchered animal products that have been put through devitalizing chemical processes and infused with chemicals and preservatives, making them more attractive, marketable and long shelf-life products, e.g. canned meat, canned soup, canned vegetable, white flour etc.

Junk food is an informal term for food of little nutritional value that is made from processed food, hydrogenated fats, chemicals and preservatives and include anything made with refined white flour, sweet desserts, fried fast food and carbonated beverages including what we refer to as mineral and malt drinks etc.

Functional Food is a natural or processed food that contains known biologically-active compounds which when taken in defined quantitative and qualitative amounts provides a clinically proven and documented

health benefit, and thus, is an important means of the prevention, management and treatment of chronic diseases of the modern age. Phytochemicals which are contained in many so called food supplements are non-nutritive plant chemicals that have protective or disease preventive properties. They are non-essential nutrients, meaning that they are not required by the human body for sustaining life. Some examples of these phytochemicals include lycopene in tomatoes, isoflavones in soy and flavonoids in fruits. Phytochemicals may be antioxidants e.g. polyphenols in tea and grapes and flavonoids in fruits and vegetables; have hormonal action e.g. isoflavones in soy; interfere with DNA replication; or have antibacterial properties e.g. allicin in garlic.

Antioxidants are phytochemicals, vitamins and other nutrients that protect our cells from damage caused by free radicals. Free radicals are formed as part of our natural metabolism but also by environmental factors including smoking, pesticides, pollution and radiation. They are unstable molecules which react with essential molecules of our body including DNA, fat and protein. They are unstable because they have one electron too much or too few. Antioxidants neutralise free radicals by receiving or donating an electron without becoming unstable themselves. They however become inactive requiring constant replenishment. The action of free radicals could increase the risk of diseases such as cancer and heart problems and could accelerate ageing. Examples of antioxidants include vitamins C, E and beta-carotene (a form of vitamin A).

Medicine is simply defined as a remedy for treating illness. A poison on the other hand is a substance that causes

illness, injury, or death if taken into the body or produced within the body.

Cardiovascular disease refers to any disease that affects the cardiovascular system, principally heart disease, vascular diseases of the brain and kidney and peripheral arterial disease.

Clinical trials are sets of tests in medical research and drug development that generate safety and efficacy data for health interventions.

Evolution of the human diet

The human diet has evolved through four stages, namely: the Miocene to early Pleistocene era, the Paleolithic era, the Neolithic era, and the Industrial Revolution.

In the Miocene to early Pleistocene era, diets consisted of foliage, leafy vegetables, fruits, seeds and nuts and supplied high amounts of fiber, plant sterols, and vegetable proteins.

The diet of the Paleolithic man (Caveman) was not much different as it also consisted mainly of plant food but in addition, contained large amounts of animal protein derived from lean meat and seafood. The Paleolithic period ended about 10,000 years ago with the emergence of agriculture during the Neolithic period.

The Neolithic era was characterized by starchy foods in the form of grains and legumes as the main dietary staples. The diet also contained dairy products as well as vegetable oils such as olive oil. Neolithic diets were sources of large amounts of fiber, vegetable protein, and plant sterols.

The Industrial Revolution brought about the most significant change in the human diet, introducing the convenience and prepackaged foods including canned meats, condensed canned soups, hydrogenated vegetable oils, and refined grains, including white flour. A major consequence of the Industrial Revolution which has taken place over the past 200 years is a human diet rich in high glycaemic index carbohydrate sources (carbohydrate sources that cause a rapid rise in blood sugar), animal products, meat, saturated fat, and dietary cholesterol but deficient in legumes, vegetables, fruits and nuts (Jew *et al*., 2009).

Vice Chancellor sir, food as a remedy for illness or food as medicine became popular in the mid-1970s following publications by the gastroenterologist Walter Voegtlin and others. These scientists believed that adopting a nutritional plan based on the presumed ancient diet of the caveman of the paleolithic era that is known variously as paleolithic, caveman, stone age or hunter-gatherer diet, and that consisted mainly of wild plants and animals, protects against chronic disease. One of the major proponents of this diet, a Swedish scientist called Staffan Lindeberg did a number of studies, now collectively known as the Kitava Study, on the non-westernised population of Kitava, one of the Trobriand Islands of Papua New Guinea. These studies conducted between 1989 and 1993, found that the people of Kitava apparently did not suffer from stroke, ischaemic heart disease, diabetes, obesity or hypertension (Lindeberg and Lundh, 1993). From about 1999, several doctors and nutritionists have argued in favour of a return to a paleothic diet or preagricultural diet and have formulated diets from modern foods that mimic the nutritional

characteristics of the ancient paleothic diet (Eaton *et al*., 2002).

The heightened interest in functional foods, which are capable of preventing or reducing the incidence of these diseases is due to the growing prevalence of chronic diseases. It bears repeating vice chancellor sir, that functional foods are foods that are consumed as part of the normal diet and contain biologically active components which can enhance health or reduce the risk of disease.

Throughout history, the food derived from Mainland Africa changed considerably as weather conditions changed on the continent, limiting the type of food available to people to eat. All modern humans were hunter-gatherers until around 10,000 years ago and lived primarily by scavenging and not actual hunting. They collected sea food, eggs, nuts and fruits in addition to scavenging. The changes in the human diet over these past 10,000 years, it is now widely held, has adversely affected a number of dietary markers of health, including the amount of glucose in blood, fatty acid composition, macronutrient composition, micronutrient composition, acid/base balance, sodium/potassium ratio, and fiber content. It is also believed that these adverse effects have occurred because the changes that have taken place in our environment, including dietary and lifestyle shifts, have happened at a rate faster than the human genome could adapt to, and so humans are still biologically adapted to the environment of their ancestors (Frassetto *et al*., 2009). This slow adaptation to modern diets (the basis of the paleolithic diet) has resulted in a multitude of chronic diseases in modern man, which our ancestors did not have.

Paleolithic Diet

Paleolithic nutrition, which is a central component of evolutionary medicine and nutritional pharmacology is based on the premise that modern humans are genetically adapted to the diet of their caveman ancestors and that human genetics have changed little since the dawn of agriculture, and therefore that an idealg diet for human health and well-being is one that resembles this ancestral diet (Lindeberg, 2005; Eaton *et al*., 2002). Contemporary Paleolithic diet based on commonly available modern foods consists of fish, grass-fed pasture raised meats, vegetables, fruit, fungi such as mushrooms, roots, and nuts and excludes grains, legumes (alfalfa, clover, peas, beans, lentils, soy, and peanuts), dairy products (milk and any of the foods made from milk, including butter, cheese, ice cream and yogurt), salt, refined sugar, and processed oils (Eaton and Cordain, 1997). Many proponents of the

Paleolithic diet recommend 56-65% of food energy from animal sources and 36-45% from plant foods. This means high protein (19-36%) energy and low carbohydrate (22-40% energy), with a fat intake (28-58%) that is not different from that found in Western diets (Strohle *et al*., 2007).

The food consumed today in most Western societies and increasingly in our society, contains food groups that were consumed in small amounts or not all by the Caveman and include dairy products, cereals, refined sugars, refined vegetable oils, and alcohol (Cordain, 2007). Grains, fats and oils, and sugar and sweeteners currently make up 65% of daily energy intake in the American diet while the contribution from legumes, nuts and soy, and from fruits and vegetables in the American diet is limited, at about 0.6%, 3.1%, and 7.8%, respectively. Generally, the paleolithic diet provided more vitamins and minerals than current American diets. Also, because current American diet consists mostly of processed food and little of fruits and vegetables, it contains more sodium and less potassium than the Paleolithic diet which also contains greater amounts of fiber. In addition, there is a shift in the ratio of n-6 to n-3 fatty acids such that the current American diet is estimated to have 10 times more n-6 fatty acids than n-3 fatty acids. Eicosanoids from n-6 fatty acids generally promote inflammation and aggregation of platelets whereas those from n-3 fatty acids are mostly anti-inflammatory and inhibit platelet aggregation (Jew *et al*., 2009).

There is a considerable amount of difference in terms of energy density between what most of us eat in the name of civilised western diet obtained from fast food restaurants and our traditional African diets. According to a study,

British fast food restaurants serve meals with average energy densities of about 1,100 KJ/100g which is about 2.5 times higher than a traditional African diet, estimated to be 450KJ/100g (Prentice and Jebb 2003). Similarly snack foods consumed in most of our homes today, including sweet snacks such as cookies, cakes, pies, ice cream and chocolate bars possess an average energy content of about 1,500-2000KJ/100g whereas, so called acceptable snacks i.e. potato chips have an energy density of about 2,200 KJ/100g. In contrast fruits and vegetables contain average energy densities of less than 100KJ/100g.

Mediterranean Diet

The Mediterranean diet is a modern nutritional recommendation inspired by the traditional dietary patterns of Southern Italy, Greece and specifically the Greek island of Crete and parts of the Middle East (Morocco).

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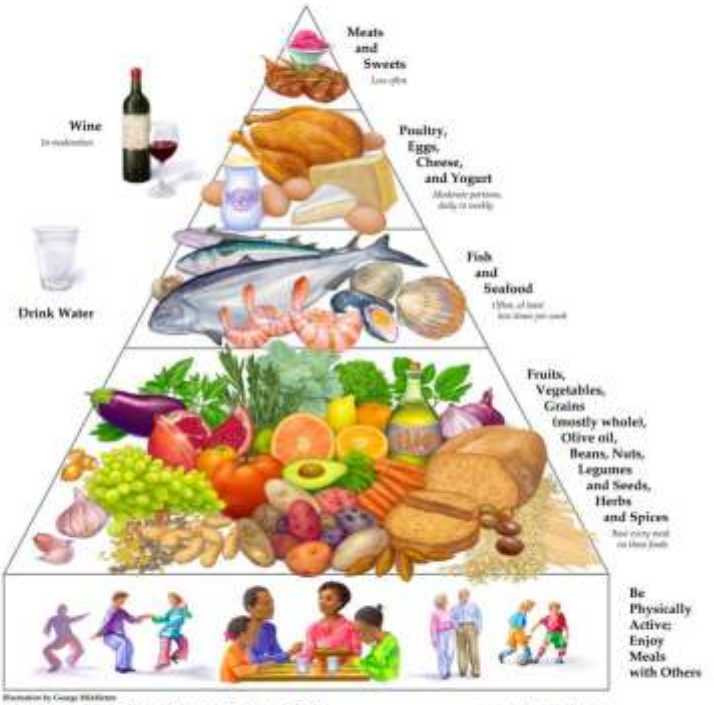
HEALTH THROUGH HERITAGE

Mediterranean Diet Pyramid



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MEDITERRANEAN FOODS ALLIANCE
AN OLDWAYS PROGRAM

Vegetables & Tubers	Artichokes, Arugula, Beets, Broccoli, Brussels Spouts, Cabbage, Carrots, Celery, Celeriac, Chicory, Collard Cucumber, Dandelion Greens, Eggplant, Fennel, Kale, Leeks, Lemons, Lettuce, Mache, Mushrooms, Mustard Greens, Nettles, Okra, Onions, (red, sweet, white) Peas, Peppers, Potatoes, Pumpkin, Purslane, Radishes, Rutabega, Scallions, Shallots, Spinach, Sweet Potatoes, Turnips, Zucchini
Fruits	Avocados, Apples, Apricots, Cherries, Clementines, Dates, Figs, Grapefruit, Grapes, Oranges, Melons, Nectarines, Olives, Peaches, Pears, Potatoes, Pomegranates, Strawberries, Tangerines, Tomatoes
Grains	Breads, Barley, Buckwheat, Bulgur, Couscous, Durum, Farro, Millet, Oats, Polenta, Rice, Wheatberries
Fish & Seafood	Abalone, Cockles, Clams, Crab, Eel, Flounder, Lobster, Mackerel, Mussels, Octopus, Oysters, Salmon, Sardines, Sea Bass, Shrimp, Squid, Tilapia, Tuna, Whelk, Yellowtail,
Poultry, Eggs, Cheese, & Yogurt	Chicken, Duck, Guinea Fowl Eggs (Chicken, Quail, and Duck Cheeses (Examples Include: Brie, Chevre, Corvo, Feta, Haloumi, Manchego, Parmigiano-Reggiano, Pecorino, Ricotta) Yogurt, Greek Yogurt
Nuts, Seeds, & Legumes	Almonds, Beans (Cannellini, Chickpeas, Fava, Kidney, Green), Cashews, Hazelnuts, Lentils, Pine Nuts, Pistachios, Sesame Seeds (Tahini), Split Peas, Walnuts
Herbs & Spices	Anise, Basil, Bay Leaf, Chiles, Clove, Cumin, Fennel, Garlic, Lavender, Marjoram, Mint, Oregano, Parsley, Pepper, Pul Biber, Rosemary, Sage, Savory, Sumac, Tarragon, Thyme, Zatar
Meats & Sweets	Pork, Beef, Lamb, Mutton, Goat Sweets (Examples include: Baklava, Biscotti, Creme Caramel, Chocolate, Gelato, Fruit Tarts, Kunefe, Lokum, Mousse Au Chocolat, Sorbet, Tiramisu
Water & Wine	Drink Plenty Of Water Wine In Moderation

In addition to regular physical activity, the Mediterranean diet emphasises abundant plant foods and fresh fruits as the typical daily dessert, olive oil as the principal source of fat, dairy products (principally cheese and yoghurt) and fish and poultry consumed in low to moderate amounts, zero to four eggs consumed weekly, red meat consumed in low amounts and wine consumed in low to moderate amounts. Total fat in this diet is 25% to 35% of calories, with saturated fats at 8% or less of calories.

The highlights of this diet include high olive oil consumption; high consumption of legumes; high consumption of unrefined cereals; high consumption of fruits; high consumption of vegetables; moderate consumption of dairy products (mostly cheese and yoghurt); moderate to high consumption of fish; low consumption of meat and meat products and moderate wine (particularly red wine) (Ellen Gouch, 2005). Red wine contains flavonoids with powerful antioxidant properties (Martinez-Gonzalez et al., 2010).

I shall in the remaining part of this lecture, outline the potential benefits and adverse effects of ingested food and food supplements; and present evidence that components of the diet of early man when consumed as functional foods today will reduce the risk of obesity, stroke, ischaemic heart disease, diabetes, cancer and osteoporosis.

Evidence that food can be medicine

In the early 1950s the Rockefeller Foundation appointed Dr Leland Albaugh Field Director to investigate causes of high rates of death on the Greek Island of Crete. After systematically reviewing every aspect of life on Crete and comparing it to life in mainland Greece and America,

Dr Albaugh reported that the rates of death in Crete were high, but the primary problem was poor public health infrastructure, poor access to good quality medical care and the availability of drugs to combat infections such as malaria, typhoid and dysentery. Importantly however, his data also showed that the adults of Crete had significantly better rates of heart disease than in America with 30% fewer deaths related to cardiovascular disease and just less than 30% deaths from cancer. Dr Albaugh's research showed that although Americans and the adults of Crete consumed similar daily calories, the food groups and nutrients for the main calories were different for the Crete and American adults (Table 1). Although the significance of this finding was lost on the investigators at the time, it has now become the basis of a very popular functional diet called the Mediterranean diet.

Table 1: Sources of calories consumed by percentage in Crete Greece and United States in 1948.

Food Group	Crete Fall 1948	Greece 1948-1949	USA 1948-1949
Cereals	39	61	25
Potatoes	4	2	3
Sugar and honey	2	4	15
Pulses and nuts	7	6	3
Vegetables and fruits	11	5	6
Meat, fish and eggs	4	3	19
Dairy products	3	4	14
Oils and fats	29	15	15
Wine, beer & spirits	1	not given	not given
Total calories per person per day	2,547	2,477	3,129
Sources of protein in the diet, by percentage			
Animal protein	24	19	66
Vegetable protein	76	81	34

Source: Jew et al., 2009

A World Health Organisation (WHO) report published in 2003 (Table 2) summarised the links between diet and obesity, diabetes, cardiovascular disease (CVD), cancer and osteoporosis.

Table 2: Summary of links between diet and obesity, diabetes, CVD, cancer & Osteoporosis

Food Type	Obesity	Type 2 Diabetes	CVD	Cancer	Osteoporosis
Energy and fats					
High intake of energy foods	C↑		C↑		
Saturated fats			C↑		
trans fatty acids			C↑		
Dietary cholesterol			P↑		
Myristic and palmitic acid			C↑		
Fish and fish oils (EPA & DHA			C↓		
Carbohydrate					
High intake of non-starch polysaccharides (dietary fibre)	C↓	P↓	P↓		
Whole grain cereals			P↓		
Vitamins and minerals					
Vitamin D					C↓
High sodium intake		C↑			
potassium		C↓			
Calcium					C↓
Fruits (including berries) and vegetables	C↓	P↓	C↓	P↓	
Beverages					
Sugar-sweetened soft drinks and fruit juices	P↑				
Unfiltered boiled coffee		P↑			
High alcohol intake		C↑		C↑	C↑
Low to moderate alcohol intake		C↓			

Adapted from the WHO 2003 report

C↑ = convincing increased risk; C↓= convincing decreased risk; P↑ = probable increased risk and P↓ = probable decreased risk

Fruits and vegetables are associated with a decreased risk for cancer of the oral cavity, oesophagus, stomach and colorectum.

High alcohol intake is associated with an increased risk of cancer of the oral cavity, pharynx, larynx, oesophagus, liver, and breast and an increased risk for stroke.

Myristic acid is a common saturated fatty acid name after the nutmeg *Myristica fragrans.*

Palmitic acid or hexadecanoic acid is the most common fatty acid and is found in palm oil but also meat, cheeses and butter. EPA (eicosapentanoic) and DHA (docohexanoic acid) are omega3 fatty acids.

Evidence of health promoting effects of Paleolithic and Mediteranean diets

The nature of the Caveman and Mediterranean diets may have stimulated the design of therapeutic diets to manage chronic diseases in this and other countries (Jonson *et al*., 2006; Osterdahl *et al*., 2008; Lindeberg *et al*., 2007). Results from studies in animals and human beings involving interventions using the Paleolithic or Mediterranean diet have been promising. For instance, a study in which piglets were randomly assigned at weaning to either a cereal-based swine feed group or a cereal-free swine feed group, showed that at 17 months, improvements were recorded in level of C-reactive protein, an anti-inflammatory marker

associated with CVD, insulin sensitivity, and blood pressure in the animals fed the cereal-free Paleolithic group. In addition, the piglets on Paleolithic diet weighed on average 20% less and had 43% lower subcutaneous fat (Jonson *et al*., 2006).

Short term intervention trials using the Paleolithic diet in humans have reported similar findings. A study by Osterdahl *et al*., (2008) in healthy human volunteers showed decreases in mean weight, body mass index, waist circumference, and systolic blood pressure. Additionally, dietary intake of fat, antioxidants such as vitamins C and E, and potassium-sodium ratio all showed favourable changes. Participants had adverse effects attributed to low levels of calcium because the Paleolithic diet excludes dairy products such as milk.

Another clinical, randomized, controlled cross-over study in the primary care setting compared the Paleolithic diet with a commonly prescribed diet for type 2 diabetes. The Paleolithic diet resulted in lower mean values of HbA1c, triacylglycerol, diastolic blood pressure, body mass index, waist circumference and higher values of high density lipoprotein when compared to the Diabetes diet. Also, glycemic control and other cardiovascular factors were improved in both diets without significant differences. It is also important to note that the Paleolithic diet was lower in total energy, energy density, carbohydrate, dietary glycemic load and glycemic index, saturated fatty acids and calcium, but higher in unsaturated fatty acids, dietary cholesterol and some vitamins.

The beneficial health effects of the Mediterranean diet are thought to be due to the eating of small portions, daily

exercise and the emphasis on freshness, balance and pleasure in food. It has for instance been reported in the Seven Countries Study that Cretan men on a traditional Mediterranean diet consisting mostly of olive oil, large amounts of fruit and vegetables, fish and a moderate amount of dairy foods and wine, had exceptionally low death rates from heart disease, despite moderate to high intake of fat. The Lyon Diet Heart Study made some modifications to the Cretan diet by replacing olive oil with rapeseed (canola oil) increasing vitamin C-rich fruit and bread by 20% and decreasing processed and red meat. The researchers found that on this modified diet, mortality from all causes in the participants who had all survived a first heart attack, was amazingly reduced by 70% (Kris-Etherton *et al*., 2001).

The British Medical Journal published a study in 2009 which reported that components of the Mediterranean diet, such as high vegetable consumption and low meat and meat product consumption, are more significantly associated with low risk of mortality than other components, such as cereal consumption and fish consumption (Trichopoulou et al., 2009)

As you may have noticed, all the health promoting nutritional plans contain fruits and vegetables and so before we make further progress let us quickly look at the health benefits of fruits and vegetables.

The culinary definition of vegetable is an edible plant or part of a plant but usually excludes seeds and most sweet fruit. This usually means the leaf, stem, or root of a plant. Although botanically, a fruit is the ovary of a flowering plant, for culinary purposes, it is any edible part of a plant with a sweet flavor.

We have all heard that an apple a day keeps the doctor away. It used to be something we said to encourage people to eat fruits. In old English the word apple was used to describe any round fruit that grew on a tree. Adam and Eve's forbidden fruit, which they ate in the Garden of Eden, is often described as an apple but in the 1611 King James Version of the Bible, it is just called fruit. There is a lot of scientific evidence that an apple a day does keep the doctor away and here is some:

Apples like many other fruits provide essential vitamins and minerals, fibre and other substances that are important for good health.

Apples like most fruits are naturally low in fat and calories and are filling. A regular size apple has between 70-100 calories. Eating an apple when craving for candy or chocolate or other junk food such as doughnuts has a mellowing effect on blood sugar that suppresses the desire, since apple itself contains sugar but gives you only a quarter of the calories.

According to a publication of the Harvard School of Public Health, fruits and vegetables lower blood pressure, reduce the risk of heart disease, stroke and some cancers (prostate, colon and breast). They lower the risk of eye and digestive problems. One of the first noticeable effects of eating fruits and vegetables is the ease with which you move your bowels.

Apples protect the brain from neurone generative diseases such as Alzheimer's and Parkinsonism. According to researchers of Cornell University, this is because of the quercetin they contain.

People who eat 5 apples or more a week have lower respiratory problems, including asthma, according to a study at the University of Nothingham.

It has been shown that the juice in apple has antibacterial properties that helps prevent tooth decay and so also keeps the dentist away (http://www.bestapples.com/healthy/).
Diets rich in fruits and vegetables which have a high content of antioxidants, promote health and reduce the effects of ageing (prevent the risk of chronic disease). However, antioxidant and vitamin supplementation has no detectable effect on the ageing process and the risk of chronic disease. This suggests that the health promoting effects of fruits and vegetable may be unrelated to their

antioxidant contents. It is believed that their content of flavonoids or a complex mix of substances may be the real reason fruits and vegetables are important in human nutrition.

It is thought that oxidation of low density lipoprotein in the blood contributes to heart disease, and initial observational studies found that people taking vitamin E supplements had a lower risk of developing heart disease. As a direct result, at least seven large clinical trials have been conducted to test the effects of antioxidant supplementation with vitamin E, in doses ranging from 50 to 600 mg per day. None of these studies found a statistically significant effect of vitamin E on overall number of deaths or on death due to heart disease. So, despite the clear role of oxidative stress in cardiovascular disease, controlled studies using antioxidant vitamins have observed no reduction in either the risk of developing heart disease, or the rate of progression of existing disease (Vivekenantham *et al*., 2003; Lee *et al*., 2005; Sesso *et al*., 2008).

There are many companies that sell formulations of antioxidants as dietary supplements, including green tea, Chinese herbs such as ginseng, grape seed, chlorophyll, Aloe vera juice, bitters (yoyo and alomo) and multivitamin preparations. While some level of antioxidants, vitamins and minerals in the diet are required for good health, there is considerable doubt as to whether these antioxidant supplements are beneficial or harmful and if they are actually beneficial, which antioxidants are needed and in what amounts. It is believed that excessive antioxidant levels may inhibit recovery and adaptation mechanisms and may also prevent many of the health gains that

normally come from exercise such as increased insulin sensitivity. Antioxidants can also be harmful if not taken in the right dose. Let me give you an illustration.

Aloe vera juice marketed by Golden Neolife Diamite (GNLD) and Forever Living Products has proven antioxidant and anti-genotoxic effects. We have demonstrated in our laboratories here that Aloe vera is effective in diminishing the toxic effects of streptozotocin and alloxan, poisons that selectively destroy the beta cells of the pancreas responsible for secreting insulin and it can completely reverse the injury caused by these poisons (Siminialayi and Odigie, 2012). We have only last year also shown that Aloe vera can blunt the hypertension-inducing effect of cadmium sulphate and completely reverse the hypertension induced by this substance (Siminialayi and Isirima, 2013). So, why is this apparently useful plant not universally available for the treatment of hypertension, diabetes and other chronic diseases? It is the same reason drug companies spend billions of dollars to make sure that a drug introduced into the market is both effective and safe.

In a study done in our laboratories here at the University and reported in the West African Journal of Pharmacology and Drug Research in 2010, we found that GNLD's Aloe vera given in recommended doses to rats for 14 days resulted in hepatic congestion, dilation of the central veins and portal triditis (inflammation of the portal triad) in 60% of the test animals. Twenty percent of the animals had intraparenchymal haemorrhage and another 20% had features consistent with neoplastic changes. Increasing the duration of treatment at the same dose from 14 days to 28

days and then to 42 days at the same dose, increased the incidence of liver toxicity (Koroye *et al*., 2010).

We observed that increasing the dose to double the recommended dose was not associated with liver toxicity when the duration of treatment was at least 28 days. However, the occurrence of hepatic necrosis at the lowest dose given over the longest duration of the experiment (42 days) suggested that a certain critical level of Aloe vera concentration or activity may be required for hepatic necrosis to occur and may have been the result of a pro-oxidant effect of the drug.

We concluded that GNLD's Aloe vera plus was hepatotoxic in laboratory rats. We think it causes liver damage in low doses by a mechanism related to induction of oxidative stress and protects in higher doses by an antioxidant mechanism. It is therefore clearly a drug to be taken with caution and one that needs to be more stringently controlled by food and drug regulatory authorities. We had similar findings in the kidneys and heart (Koroye, et al. 2010).

TABLE 3. TIME-DEPENDENT HEPATOTOXICITY OF ALOE VERA PLUS

	NUMBER OF RATS								
Duration of Treatment	**No effects**		**Toxic**	**Mild to Moderate Toxicity**			**Severe Toxicity**		
	0.2ml	**0.4ml**	**0.8ml**	**0.2mls**	**0.4ml**	**0.8ml**	**0.2ml**	0.4ml	0.8ml
14 days	**5**	**2**	**3**	**0**	**1**	**2**	**0**	**1**	**0**
28 days	**2**	**2**	**2**	**3**	**2**	**2**	**0**	**1**	**1**
42 days	**3**	**4**	**4**	**1**	**1**	**1**	**1**	**0**	**0**

TABLE 4: DOSE- DEPENDENT HEPATOTOXICITY OF ALOE-VERA PLUS

Dose of Aloe vera Plus twice daily	NUMBER OF RATS								
	No Toxic effects			Mild to Moderate Toxicity			Severe Toxicity		
	14days	28days	42days	14days	28days	42 days	14days	28days	42days
0.2ml	5	2	3	0	3	1	0	0	1
0.4ml	2	2	4	1	2	1	1	1	0
0.8ml	3	2	4	2	2	1	0	1	0

How is food Harmful?

I shall limit myself to the effects of food that hinder us from attaining the declaration in Psalm 90:10; "the days of our years are three score years and ten….." Food can be harmful because it lacks sufficient amounts of macronutrients or micronutrients, because it is too energy dense or because it contains chemicals that cause harmful effects or are simply put, toxic. We already know from our experience as mothers and from elementary biology that a deficiency of vitamin C causes scurvy, or that a dietary deficiency of the amino acid, niacin causes pellagra and that inadequate intake of protein causes what paediatricians call protein energy malnutrition or kwashiokor.

When we eat in excess of our bodies' energy needs, the excess is stored in adipose (fatty) tissue, skeletal muscle and other sites as fat and then we become overweight and eventually obese. When we eat the wrong kind of food we may immediately suffer the adverse effects which may manifest as allergic reactions or acute poisoning or when food contains harmful substances, we may over time increase our risk of suffering from cancer, diabetes, high blood pressure, myocardial infarction (heart attack) and stroke.

First, Vice Chancellor Sir, let me quickly address in some detail how food may be harmful by using junk food and particularly, two components of junk food, white flour and trans fat as case study. Junk food as I mentioned earlier is made largely from processed food.

Refining is one of the measures by which processed foods are made. Refined flour has the brown husk of the wheat grain removed, leaving the white, refined starch found in white bread, white rice, pasta, biscuits and many other junk foods. Without the fibrous husk, refined starches are broken down quickly into glucose which is readily absorbed into the blood stream, causing glucose levels to rise quickly (hyperglycaemia) and inducing higher than normal levels of insulin secretion (hyperinsulinaemia) to bring it under control. Both these effects increase the risk of obesity and hypertension.

Eating whole grains, such as, whole wheat bread, cereals, brown rice and barley with the bran surrounding intact, on the other hand, leads to a much slower absorption of sugar into the blood stream than occurs with refined starches and reduces the risk of obesity.

Additionally, refining destroys and devitalizes most good foods. Healthy unsaturated fatty acids are lost during the milling process. Half the vitamin E is destroyed when the wheat germ and bran are removed. Refining wheat into flour removes between 50 and 93% of wheat's magnesium, zinc, chromium, manganese and cobalt. Approximately 50% of calcium, 70 percent of phosphorous, 80 precent iron, 50% potassium, 65% of copper, 80% of thiamin, 60% of riboflavin, 75% of niacin, 50% of panthotenic acid and about 50% of pyridoxine is lost.

Fast foods or junk foods are harmful because they are made from processed white flour and oils rich in trans-fats. Trans-fats are formed by the process of hydrogenation of vegetable oils to convert the readily oxidisable fatty acids such as linoleic acid into oxidation-resistant fatty acids. Oxidation of fatty acids makes vegetable oils rancid but the trans-fats (as opposed to cis-fats) that result from hydrogenation are unnatural and harmful. Trans-fats raise LDL- or bad cholesterol and lower HDL- or good cholesterol. Scientists do not yet know why, but the addition of hydrogen to oil increases blood cholesterol more than do other types of fats. It is believed that the addition of hydrogen to oil makes the oil more difficult to digest and the body recognises trans-fats as saturated fats. Junk foods (meat pies, doughnuts, sausages, and others foods prepared with hydrogenated oils including fried rice) are thus very high calorie (energy dense) meals which contain more fat, cholesterol, salt and sugar, fewer vitamins, minerals and other nutrients, than fresh food. Several studies have shown that apart from their nutritional deficiencies, fast foods promote weight gain. In addition, junk food consumption alters brain activity in a

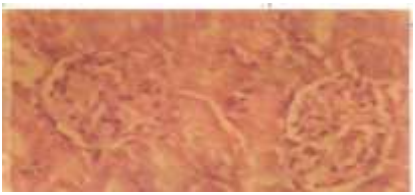
manner similar to addictive drugs like cocaine and heroin, leading to compulsive eating for pleasure.

Harmful Supplements

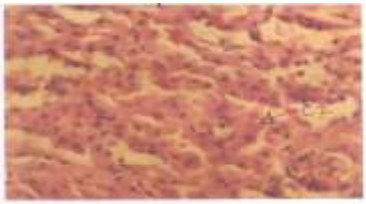
The ingestion of high dietary protein as a means of weight control is common practice the world over. In Nigeria, food supplements such as the protein powder manufactured by Golden Neo Life Dynamite (GNLD) are said to have beneficial effects in conditions such as diabetes mellitus, hypertension and obesity and so, ingested by many Nigerians.

In a study we did in 2009 and published in the Port Harcourt Medical Journal in 2010, we administered GNLD's protein powder dissolved in milk as recommended by the manufacturers for 4 weeks to apparently healthy albino rats in three different doses and compared the effects with control animals given water only. We found on histological examination of the harvested kidneys, following the 4-week period of treatment, tubular necrosis, thickened capillary walls, collapse and hypercellularity of the glomeruli. These changes were seen in all groups except those given water only; the severity increasing with increasing dose of protein powder.

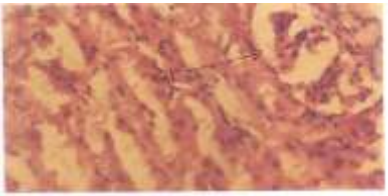
Normal tubular architecture in Control rats given water only



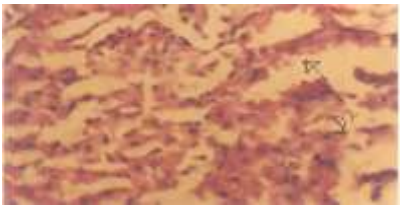
Normal glomeruli in control rats given water only



Tubular necrosis (C2) induced by 0.8mg/kg induced by of *protein powder*



Glomerular collapse (G1) *0.8mg/kg of protein powder*



More Pronounced tubular necrosis induced by 1.6g/kg of protein powder (D2)

More pronounced hyperecellularity and glomerular collapse induced by 1g/kg (D1)

As can be seen from the photomicrographs above, the long-term ingestion of GNLD's protein powder had harmful effects on the kidneys of Wistar albino rats and this happened with all the doses of protein powder administered. This product should therefore be used with caution by the general public and avoided completely by patients for whom the ingestion of high protein diet would ordinarily be deleterious, such as diabetics and hypertensives with compromised renal function (Siminialayi *et al*., 2010).

COMPLICATIONS OF EXCESSIVE INTAKE OF CALORIES

Obesity.

The development of obesity occurs when the caloric intake is disproportionate to the energy expended. Three metabolic factors have been reported to be predictive of weight gain: a low adjusted sedentary energy expenditure, a high respiratory quotient (RQ; carbohydrate to fat oxidation ratio) and a low level of spontaneous physical activity. A low RQ of 0.7 suggests that a person is oxidizing more fat than carbohydrate, whereas a ratio of 1.0 suggests that more carbohydrate than fat is being oxidized.

Obesity is defined as an excess of fatty tissue or adipose tissue. Adipose tissue in humans functions to store energy in the form of fat and triglyceride is the main storage fat. There are two main types of adipose tissue: subcutaneous adipose tissue or fat tissue between the skin and muscle and visceral adipose tissue or fat tissue found within the main cavities of the body, primarily the abdominal cavity. Visceral adipose tissue is more metabolically active as it releases large amounts of free fatty acids.

Definitions for reporting healthy weight, overweight and obesity are usually based on anthropometric measures, and one of the simplest anthropometric indices of adiposity is weight adjusted for height or the Quetelet's index, also called body mass index (BMI). The BMI defined as weight (in kilograms) divided by the height (in meters) squared, provides a single estimate of adiposity (regardless of height) that can be compared across studies and across populations. The validity of BMI as a measure of adiposity is supported by its association with obesity related risk

factors such as blood triglycerides, total cholesterol, blood pressure and fasting blood glucose levels. BMI is however a less valid indicator of adiposity among the elderly, who tend to have a shift of fat from peripheral to central sites. For such populations and with evidence of health risks associated with abdominal (visceral) fat, waist circumference, a measure of central adiposity is preferred. The international Day for the Evaluation of Abdominal Obesity (IDEA) study showed that waist circumference is a stronger predictor of cardiovascular disease outcomes than BMI. This study also showed that each increase in waist circumference of 14 cm for men and 14.9 cm for women increased the likelihood of an individual having cardiovascular disease by between 21% and 40%. It has also been reported that many disorders occur with greater frequency in fat people; the most important and common of these being hypertension, type 2 diabetes mellitus, hyperlipidaemia, coronary artery disease, degenerative joint disease, gall bladder disease, certain cancers and psychosocial disability.

We did a study to determine the prevalence of obesity as determined by BMI and waist circumference estimations among Nigerian adults attending outpatient family medicine clinics at two locations, Okrika and Port Harcourt and to assess the relative associations of these two measures of adiposity with CVD risk, in 2006 which was published in the Nigerian Journal of Medicine (Siminialayi *et al*., 2006). Here's what we found:

1. Consistent with other reports across the world we found obesity defined by waist circumference (greater than 102cm in men and 88cm in women) or BMI (greater than or equal to 30 $kg/m^{2)}$ was more prevalent in women.

2. 39.5% of our study participants with abdominal obesity admitted a family history of obesity. Most studies attribute a 30-40% variance in BMI or waist circumference to genetics and 60-70% to environment.

3. An individual with a high BMI is more likely to also have a large waist circumference than the other way around, confirming an earlier report that "a patient with excess fat will rarely have a small waist and a larger waist is linked to worse cardiovascular disease outcomes."

4. The prevalence of both high BMI and large waist circumference increased with age and obesity among young adults was more prevalent at the urban Center.

5. Abdominal obesity was associated with a greater proportion of subjects with metabolic syndrome as defined by ATP III in both Okrika (77.6% compared to 74.4%; $p>0.05$) and Port Harcourt (71.4% compared to 58.6%; $p>0.05$) than BMI. The difference was however not statistically significant as seen in p values, perhaps because this study was not powered sufficiently to detect a true difference.

In obesity, insulin signalling i.e. the ability of insulin to stimulate a fall in blood glucose is defective and even more reduced in obese type 2 diabetics. Obesity is also associated with other post-receptor binding defects in insulin action, including impaired generation of second messengers, diminished glucose transport and abnormalities in some critical enzymatic steps involved in glucose use. However, obese subjects with depressed insulin-mediated glucose transport can recover this response after weight loss.

As body fat increases, the rate of lipolysis rises, leading to increased free fatty acid (FFA) mobilization and consequently to increased FFA oxidation in muscle and

Obesity Epidemic, Pi-Sunyer

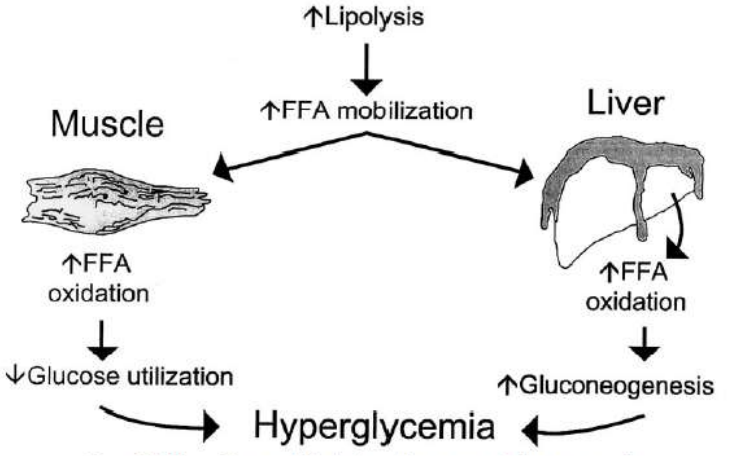


Figure 3: Effect of increased lipolysis on glucose use and gluconeogenesis

liver. As a result, glucose use by muscle declines as FFA is used as alternate energy source, and hepatic glucose production increases in response to higher FFA oxidation. These actions result in high blood sugar (hyperglycaemia) and impaired glucose tolerance. This mechanism is particularly important in people with abdominal obesity. Thus, obesity, particularly abdominal obesity, increases the risk for glucose intolerance.

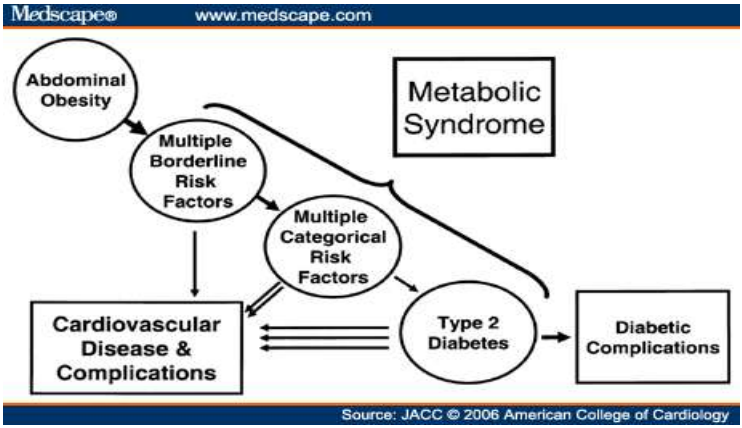
Metabolic Syndrome

A syndrome (from the Greek word *syndros*, meaning running or occurring together) in medicine is a group of conditions or disorders that occur together and that are characteristic or indicative of a specific disorder. Metabolic

syndrome is thus a cluster of cardiovascular disease risk factors that include; abdominal obesity, hypertriglyceridaemia, low HDL cholesterol, high blood pressure, high fasting blood glucose, and microalbuminuria**.** It has been demonstrated that the prevalence of hypertensive heart disease, myocardial infarction and stroke are approximately 3-fold higher in subjects with the metabolic syndrome than it is in those without the syndrome.

The natural history of the metabolic syndrome and its complications are described in Figure 1. Most individuals who develop the syndrome first acquire abdominal obesity without risk factors, but with time, multiple risk factors begin to appear. At the beginning, they usually are only borderline elevated; later and in many individuals they become categorically raised (Grundy, 2006). In some, the syndrome culminates in type 2 diabetes. If atherosclerotic cardiovascular disease (ASCVD) develops, cardiovascular complications—cardiac arrhythmias, heart failure, and thrombotic episodes—often ensue. Those with diabetes can further acquire a host of complications including renal failure, diabetic cardiomyopathy, and various neuropathies. When ASCVD and diabetes exist concomitantly, risk for subsequent cardiovascular morbidity is very high. Patients with metabolic syndrome can manifest a variety of other conditions that complicate their management: fatty liver, cholesterol gallstones, gout, and sleep apnea. The presence of several or all of these outcomes commonly leads to the use of multiple medications (polypharmacy). Not only does polypharmacy carry the risk of adverse drug interactions, it interferes with compliance, and for many patients, imposes a prohibitive cost burden (Grundy, 2006).

It is important to keep in mind how we got here: obesity resulting from eating palatable foods with high calorie density, that are readily available in pre-packaged forms and in fast food restaurants and drinking too much soft drinks and beer. A marked reduction in the physical activity that we used to engage in on a daily basis as a result of labour saving technology and laziness on our part. Finally, we got here by our indulgence in a sedentary lifestyle—increasingly common among children, because of the widespread availability of electronic devices in the home.



Progression and outcomes of the metabolic syndrome.

We did two studies on the prevalence of metabolic syndrome (Siminialayi *et al*., 2010; Siminialayi and Emem-Chioma, 2010). The first study was in adult Nigerian patients attending Family Medicine Clinics at Okrika General Hospital (OGH) and Brathwaite Memorial Specialist Hospital (BMSH) and the other among adults in a farming community at Odufor-Etche.

We found in the first study that the unadjusted and age-adjusted prevalence rates of metabolic syndrome (ATP III) at BMSH were 19.8% and 20.9% respectively, while they were 34.2% and 31.6% respectively at OGH. At both centres it was significantly higher in women. The most outstanding finding from this first study however, was that the prevalence of low HDL-cholesterol was very high at both centres (78.3% at BMSH and 92.1% at OGH). This result was alarming because as I mentioned earlier low HDL-cholesterol is a risk factor for cardiovascular disease. However, we compared it to the results from the only national survey of non-communicable diseases in Nigeria, reported in 1997 and found that they were similar. That study reported the mean HDL-cholesterol as ranging from 0.92±0.42 mmol/L in rural areas to 1.17±0.55 mmol/L in urban centres. We found the mean HDL values to be 0.68±0.02 for OGH and 0.89±0.03 for BMSH. Importantly, the relative risk of low HDL-cholesterol for metabolic syndrome was 6.73 (95% CI: 0.99-45.55) and this was not significant. In other words the risk of having metabolic syndrome and by extension cardiovascular disease was very small when one had low HDL-cholesterol. This position is supported by recent studies that reported that some people have genetically determined low HDL levels and that in such people raising HDL concentration did not significantly improve cardiovascular disease risk as compared to lowering LDL-cholesterol.

In the second study, we found the prevalence of metabolic syndrome was 6.3% at Odufor-Etche and that the prevalence of central obesity in this community was 5.33% (RR 3.3 [95% CI: 1.08-10.26]). The prevalence of hypertriglyceridaemia was 11.3% (RR 21.91[95% CI: 8.42-

57.32]) and that of low HDL 85.67% (the RR was incalculable).

For long it has been held that the main determinant of metabolic syndrome is excess fat that often but not always results in insulin resistance. This study highlighted the fact that obesity is not always the key determinant of metabolic syndrome because, of the 16 participants that had abdominal obesity only 3 had metabolic syndrome. Compare that to 14 out of 34 participants with high serum triglyceride level that also had metabolic syndrome.

The Odufor people are highly active subsistence farmers that eat mainly carbohydrates in the form of cassava and yam for all three meals of the day. It has recently been reported that the excessive intake of carbohydrates and saturated fats in addition to causing obesity could directly induce several pro-inflammatory effects, including the increased production of reactive oxygen species, up-regulation of nuclear factor beta in monocytes and polymorphonuclear cells and C reactive protein production. Also, we now know that beside adiposity, low grade systemic inflammation can induce insulin resistance.

Insulin resistance is an impaired biological response to insulin's actions in skeletal muscle, liver and fatty tissues. What this means is that fat, muscle and liver cells are less able to take up glucose from the blood and there is an increased production of glucose from non-carbohydrate sources that adds to increased circulating glucose concentrations and compensatory increased insulin secretion, enhanced free fatty acid release by fatty tissue that can result in increased blood triglyceride concentration and reduced HDL-cholesterol and protein breakdown. This

also means recently identified biological functions of insulin, including anti-inflammatory effects mediated by decreasing nuclear factor beta and increasing inhibitor of nuclear factor beta among others are inhibited. Thus insulin resistance not only accelerates atherogenesis through the development of classical metabolic risk factors but also by directly generating pro inflammatory and pro thrombotic states.

What should we eat?

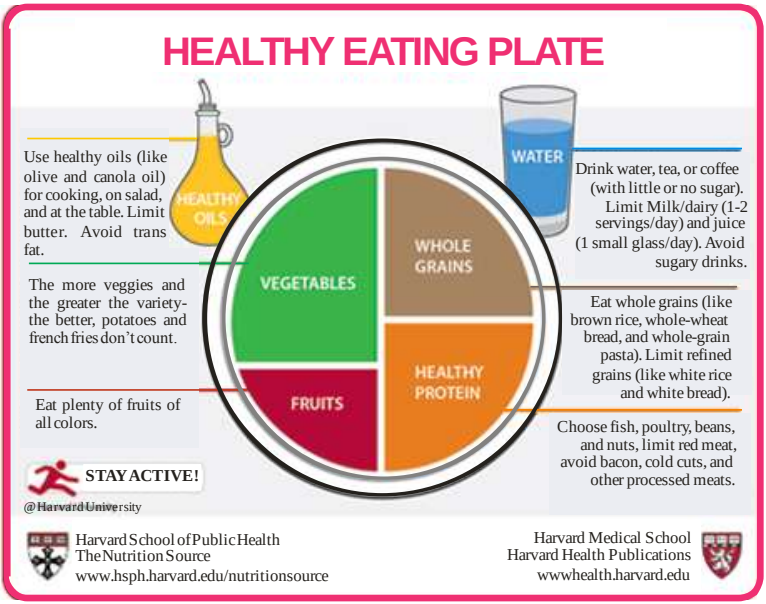
We could adopt a nutritional plan that is based on the Paleolithic diet or the Mediterranean diet, the components of which I have shared with you. However, doing so may pose significant challenges. For instance the Paleolithic diet derives most of its macronutrients from wild game animal protein and we cannot very well, go out and catch an antelope or a grass cutter for lunch or dinner every time we are hungry. The Caveman diet also lacks Vitamin D and calcium because of the exclusion of dairy products. Some fears have also been expressed about the high salt content of some foods included in the Mediterranean diet, such as olives, salt-cured cheeses, anchovies, capers, salted roe, and salads dressed with extra virgin olive oil. More importantly, most of these diets are foreign to us and so the components are not readily available.

It may therefore not be practical to convert solely to one or the other. It may however be easier and of greater value to us to evolve a diet plan that includes the health promoting components of these diets as functional foods and adopting a healthy lifestyle, to prevent chronic disease.

The chart below, published by the Harvard School of Public Health summarises what we should be eating, drinking and doing.

Avoid junk food as much as possible. I say this because it may be near impossible to completely avoid these highly attractive and palatable dishes. Also avoid carbonated and sweetened soft drinks such as coke, sprite, malt drinks, alcohol (except moderate quantities of red wine) and tobacco. These things give you so much unwanted calories and actually contain harmful substances such as trans fatty acids and refined sugar.

In place of food made out of white flour - white bread, cakes, biscuits, white spaghetti eat whole grains such as whole wheat bread, brown rice and whole grain pasta.



Use healthy oils such as olive oil and canola oil. Both of these oils are heart healthy and can be used for baking and cooking. However, olive oil is a wholly natural oil made by pressing ripe olives at cold temperatures to preserve the nutritional content and collecting their juices. Olive oil contains polyphenols, antioxidants and omega-3 fatty acids. Canola oil on the other hand is made from a hybrid of the rapeseed plant, and is a vegetable oil. Some people have reservations about canola oil because it is manufactured at high temperatures using processes that may involve the use of toxic chemicals such as hexane. It is de-gummed, deodorised, bleached and further refined at high temperatures. It is believed that these high temperatures may change the omega-3 content and significantly increase its content of trans fatty acids and saturated fats. Canola oil is however undoubtedly good for

your heart and is endorsed by the British Heart Foundation.

Olive oil is available in the market in different forms. Extra virgin olive oil is the best and is collected from the first pressing of the olive. It contains the most nutrients. Virgin olive oil is collected from the second pressing. Oils derived from subsequent pressing are used to make light and pure olive oils, which may undergo further processing.

It is recommended we eat fruits and vegetables with every meal, very day. Fill half your plate with vegetables at very meal and eat fruits and vegetables at snack time too. You should have at least 5 portions of fruits and vegetables each day. A portion of fruits or vegetable is: a dessert bowl of salad; a handful of grapes, cherries or berries; a glass of fruit juice (150 mls); two tablespoons of beans and pulses (lentils, kidney beans etc). Note that however much of fruit juice or beans and lentils you eat, you can only count these as one portion per day. One apple, one orange, one mango, banana, pear or other medium sized fruit; half a grape or avocado; one slice of a large fruit e.g. water melon or pineapple. To find out more about this or how much you need to eat for your weight, sex and physical activity level, please visit: http://www.cdc.gov/nutrition/everyone/fruitsvegetables/howmany.html

Eat healthy protein such as that derived from fish, poultry, beans and nuts. Limit red meat to small portions of pasture-raised beef and wild game meat. Remember that although the Caveman ate large amounts of meat, he was highly mobile (physically active) and also consumed large amounts of monounsaturated and polyunsaturated fatty acids, n-3 fatty acids and fruits and vegetables, all of which

are believed to mitigate the adverse effects of high protein intake.

Drink water, tea and coffee (with very little or no sugar), red wine, and freshly squeezed orange or some other fruit juice (at least one 150 ml glassful daily). Water contains no calories and the others all contain high amounts of natural antioxidants that have been proven scientifically to be beneficial. Avoid alcohol in the form of beer and spirits, sugary drinks such as coke (even diet coke), Guinness or Amstel Malta and the so-called high energy drinks.

Finally, you must find time to exercise. It is recommended that you aim to take 10,000 steps a day but any amount of exercise daily is helpful. There are devices called pedometers that help you keep count of how many steps you have taken daily. The advantage in wearing them every day when you step out of your house is that you are consciously trying to meet a target and so you walk when you do not have to drive, you walk on the spot in your office while reading papers etc.

You can get more information at www.cdc.gov/nutrition/everyone/basics/foodgroups.html and www.cdc.gov/nutrition/everyone/fruitsvegetables/index.html

How much should we eat?

You can get fat eating a perfectly healthy diet and so how much you eat is very important, whether it be fruits or vegetables alone or a Paleolithic or Mediterranean type diet. How much we should eat depends on many factors, including how tall we are, how old we are, whether we are male or female, our general state of health, what jobs we do, what leisure time activities we partake in, genetics,

body size, body composition, and what medications we may be on. As a general rule, if we consume more than we use up by way of calories we gain weight and if the converse happens, we lose weight. There are certain other factors which may give you extra wiggle room on the amount you can eat: for example, if your food contains a lot of fiber you can usually eat more calories than if you eat food with a very low fiber content.

Put simply, how much you eat is very closely linked to the types of foods you eat and your lifestyle. Also, how much each one of us should eat depends on what our aims are: to maintain our body weight, lose or gain weight, or prepare for some sports event. However, any focus on food quantity intake is closely linked with calorie consumption.

Calories are a measure of how much energy there is in the food we eat. By understanding calories you can work out how much food you need to eat. Different foods have varying number of calories per gram of weight. The first step in working out how much you need to eat is to work out your basal metabolic rate (BMR). Below are some general daily calorie requirements for males and females.

The Harris–Benedict equations revised by Roza and Shizgal in 1984.

Men	BMR = 88.362 + (13.397 x weight in kg) + (4.799 x height in cm) - (5.677 x age in years)
Women	BMR = 447.593 + (9.247 x weight in kg) + (3.098 x height in cm) - (4.330 x age in years)

My BMR using the above formula is 88.362 + (13.397 x 102) + (4.799 x 182) – (5.677 x 49) = 88.362 + 1366.49 + 873.42 – 278.17 or 2,050.10

The next step is to work your recommended daily calorie intake and how you this do is dependent on whether you do not exercise at all, you do light exercise, moderate exercise or heavy exercise as indicated in the table below.

Little to no exercise	Daily kilocalories needed = BMR x 1.2
Light exercise (1–3 days per week)	Daily kilocalories needed = BMR x 1.375
Moderate exercise (3–5 days per week)	Daily kilocalories needed = BMR x 1.55
Heavy exercise (6–7 days per week)	Daily kilocalories needed = BMR x 1.725
Very heavy exercise (twice per day, extra heavy workouts)	Daily kilocalories needed = BMR x 1.9

Available at: http://www.globalrph.com/revised-harris-benedict-equation.htm

Because I do light exercise, my daily requirement will be 2050.10 x 1.375 or 2818.89 Kilocalories to maintain my current weight. To lose weight I need to consume less than this amount of calories daily or increase my activity level or do both. Using the Harris-Benedict Principle, if someone has a daily allowance of 2500 kilocalories, but he reduces his intake to 2000, then the calculations show a one pound (453.59g) loss every 7 days. I won't bother you with the details of the mathematics involved in calculating this.

Recommendations

Vice Chancellor sir, I shall like to end this lecture by making a few recommendations.

Marcus Tullius Cicero, ancient Roman lawyer, writer, scholar, orator and statesman once said, "in nothing do men approach so nearly to the gods, as in giving health." This country can do more, by way of giving health to its citizens and that is why I think the time has come for our country to have the equivalent of the National Institutes for Health (NIH) in the United States. NIH's mission is "to seek fundamental knowledge about the nature and behaviour of living systems and the application of that knowledge to health, lengthen life, and reduce the burdens of illness and disability." To achieve its objectives, the NIH "provides leadership and direction to programmes designed to improve the health of the nation by conducting and supporting research in the causes, diagnosis, prevention and cure of human diseases; in the biological effects of environmental contamination," among other things.

The NIH is an organ of the Department of Health or our equivalent of the Federal Ministry of Health. A Nigerian NIH would promote competitive research, promote capacity building for quality research and promote academic excellence, but more than anything else generate and disseminate knowledge that will lengthen life and reduce the burden of illness and disease. Vice Chancellor Sir, I am sure you are aware that no Nigerian living in the country or in the diaspora was able to win the NLNG Prize for Science that is worth $100,000 for three years (2009-2012) as a result of a dearth of groundbreaking research in the sciences. This will be one way of correcting that situation.

2. As we will all agree by now, Management has been serving us junk food at Senate and other meetings of the University. Vice Chancellor Sir, I am sure that for the same amount of money that we spend on purchasing lunch at Sammies Restaurant, we can get someone to give us a quality meal based on my definition of a functional diet, with perhaps a one-off additional investment in trays, plates and other utensils for serving the meals. UPWA may be willing to help us with this.

3. Thomas Jefferson, the 3rd US President and author of the Declaration of Independence, recommended a longtime ago, "to leave all the afternoon for exercise and recreation, which are as necessary as reading. I will rather say more necessary because health is worth more than learning." His advice is even more poignant when you consider that he lived between 1762 and 1826. Vice Chancellor Sir, we already have Wednesday afternoons free for sports. It should not be for students alone. I think the Vice Chancellor can lead a new, weekly "walk for life" or “walk for wellness” program that will involve all staff walking from the Senate Building to Delta Park and back beginning at 4 pm every Wednesday. Accordingly, staff can come to work on Wednesdays dressed in sportswear and comfortable walking shoes or change into sports clothes just before 4 pm, whatever Management approves.

May your days on earth be long and may it be well with you all.

I thank you for coming to listen to this lecture.

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CITATION ON
PROFESSOR IYEOPU M. SIMINIALAYI
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Iyeopu Minakiri Siminialayi, a professor of endocrine pharmacology is a 1988 Bachelor of Medical Sciences in Pharmacology and a 1991 Bachelor of Medicine and Bachelor of Surgery degree holder, from this university. He is also a 2003 Master of Science in Pharmacology graduate from the University of Lagos and a 2008 Doctor of Medicine in endocrine pharmacology and metabolic medicine graduate from the University of Port Harcourt.

Born on March 22, 1965 in Kano City, he hails from Okrika in Rivers State, where he attended primary school from 1970-1976. He had his secondary education at Government Comprehensive Secondary School, Port Harcourt from 1976-1981 and did A' levels at Federal Government

College, Port Harcourt, before being admitted into this university to study medicine in 1984.

Professor Iyeopu Siminialayi has, at various times in his academic career, been meritoriously awarded a Federal Government Scholarship [1982-1983], Best Graduating Student in Pathology in 1991 and Prof Mabadeje's Prize for Best Graduating Student in M. Sc. Pharmacology in 2003. He passed the United States Medical Licensing Examination Steps 1 & 2 [1994/1995] and Graduate Records Examination in 2003.

Professor Siminialayi joined the services of the University of Port Harcourt in 1994 as Lecturer II in the Department of Pharmacology, College of Health Sciences and rose to the rank of Lecturer I in 2001, Senior Lecturer in 2004 and Professor in 2010.

He has served the University and larger society in various capacities and is currently the Dean, Faculty of Basic Medical Sciences, a member of the University's Professional Ethics Committee, Research Ethics Committee, and Chairman of the PTA of his children's secondary school. He is a reviewer for several local and international journals including Biomed Central Publications, based in the United Kingdom and an external examiner to nearly every medical school in the South-South region of Nigeria and others. He has over 40 published articles in local and international journals to his credit and supervised 8 M.Sc. projects, one of which won third prize at the NUC National research fair held in Abuja in 2012 and a Ph.D. He is a member of the West African Society for Pharmacology, the Nigeria Medical Association and the Academic Society of Functional Foods and Bioactive Compounds. His research

interests include obesity, diabetes mellitus, metabolic syndrome and food as medicine.

The second of 5 children (four men and one woman), Professor Siminialayi is married to Mrs. Tonbra Theresa Siminialayi (Nee Ebikebina) and has 3 children: Fayeofori Wilfred, Tamunoibiton Daphne and Tamunomieibi Simon. His mother, Mrs Dinah I Siminialayi is a retired headmistress and his Father Mr Frank Siminialayi Obi died in 1966 in Kano, in the uprising that followed the Coup of that year.

Vice Chancellor Sir, ladies and gentlemen, I present to deliver the 109th inaugural lecture, a gentleman per excellence, a quietly brilliant academic, a principled man, a man obsessed with excellence and rectitude in his personal conduct and in those he mentors, a consummate administrator, a doting father and loving husband, Professor Iyeopu Minakiri Siminialayi.

Professor Hakeem B. Fawehinmi