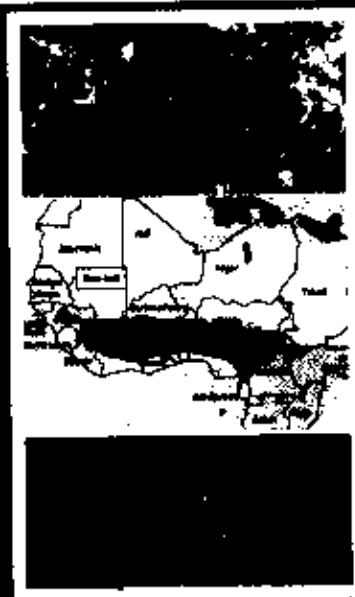


**FEDERAL UNIVERSITY OF TECHNOLOGY
OWERRI, NIGERIA**



34th Public Lecture

CHARACTERIZATION OF
FOREST WEST AFRICAN DIET TYPE
AND MANAGEMENT OF RELATED
MODERN DISEASES



WEDNESDAY 17TH JULY, 2019

**CHIDI G.
OSUAGWU, Ph.D**

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PROLOGUE

A people, over sufficiently long time, genetically or epigenetically, adapt to their environment. The most intimate part of the environment to any people is their food. Alienation from their environment and food; such as befell the African Diaspora in the Americas through Atlantic slavery, or displacement of their indigenous food by some alien diet; such as is befalling contemporary Africans through colonialism is, physiologically, stressful. Stresses; displacements from ideal nature, cause diseases. The adapted indigenous food and diet of a people is, all factors considered, the best for their wellbeing. Bleaching red palm-oil; to remove carotenoids, and then buy vitamin A; carotenoid supplement, is like selling nutrient-rich shelled breadfruit to buy starchy rice; a disease of ignorance. Diseases, including ignorance, cause death.

ABSTRACT

The nutritional essence of a People's diet can be summarized in terms of their food-inherent bioactive chemical functions. Two crops define the food culture of Forest West Africa; Yam (*Dioscorea* spp.) and the Oil-palm (*Elaeis guineensis*). These two crops define the area, agriculturally, as *Yam* or *Palm* belt, and the diet as the *Yampalm Diet Type*. For seasoning; the main spice of the cuisine is capsaicin-rich pepper, and their traditional salt mainly potassium-rich wood-ash. Folic acid-rich green leafy-vegetables is, also, basic to the diet. These bioactive chemical functions in these foods characterize the diet. They are adapted to the acidic, equatorial, body of the people. Apart from the basic supplies of *energy* and body-building *structural elements*, characteristic Forest West African foods' physiological functions are: *Alkalization, Ketogenesis and Bioelectrical modulation*, to obviate bio-redox stresses. Failure of adopted modernization diet (mainly wheat, milk and meat) to fulfill these functions makes the people more susceptible to modern metabolic syndromes. The structures and known metabolic activities of isolated chemical functional essences; such as *dioscorin* in yam and *tocotrienols* in palm oil, suggest they are the best potential treatments to the diseases caused by their dietary abandonment. The *YamPalm Diet* of Forest West Africa contains the functional essence of antimetabolic syndrome. Elimination of gluten and lactose; and other metabolic syndrome-promoting essences of wheat and milk, would be healthful to Forest West Africans. A return to indigenous food consumption for healthful life is advised by the facts.

Key terms: Yampalm diet, homeokinesis, functional food, bio-redox, dioscorin, tocotrienol, alien food, lactose intolerance, microbiome remediation, metabolic syndrome.

1.0 INTRODUCTION

1.1 Living Things

Scientists realize how very difficult it is to know things for what they really are. To avoid wasting time playing God; who only knows all, scientists try to know and identify things by what they do. This is called *operational* or *functional* definition of things. Ancient Igbo, who were scientific-minded, framed the concept of operational or functional definition as "*Ihe a kporo aha, nwere ihe o na eme*". Whatever has a name is a function! That is why, among scientists, living things; which are so complex as to be nearly imponderable, are known or identified by certain functional attributes. These functions include reproduction, feeding, growth, movement, etc. (1). One can reduce these concepts to skeletal, functional, attributes as scientists are wont to, and so conceive a living thing as:

A hyper-complex system of decayable energy-driven, self-reproducing and remodeling, aggregation of dynamic-equilibrial entities homeokinetically aligned in space-time.

The above concept only says, in less familiar words, that living things are made up of very many interacting parts that, driven by energy, are moving and adjusting all the time while staying in balance with each other as a whole. The usefulness of this barest functional conception, which might appear as oversimplification, is the highlight of the essential roles of the factors of *Energy, Equilibrium, Homeokinesis, Complexity, Reproduction, Continuous remodeling* and *Decay* in the existence and functioning of living things. *Homeokinesis* is the organizing principle of living systems; as a dynamic self-organizing system (2,3). Operational or functional definitions help scientists operate on or manipulate the functions of things, to human practical advantage, as technology. For this

lecture concerned with food, though, living thing as feeder is the essential functional concept.

Food is, usually, organic substances; from other organisms, from which living things extract i. Energy to power themselves, and ii. Structural elements; for the building up and maintenance of their bodies. Because living things vary and their environments vary, their foods vary. For any people, their food and how it is prepared and consumed is their Diet.

Living things vary in size and complexity from invisible microbes, to very large plants and animals. Human beings are living things. Humans are a particular species of living things, *Homo sapiens*. All living things can be viewed as biological machines run by energy, as indicated above. Energy utilized by living things on Earth come, ultimately, from the sun;

$6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Solar Energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$...Photosynthesis.

$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy}$...Respiration.

Energy from the sun is used to combine carbon dioxide (CO_2) and water (H_2O). This forms the energy-rich compounds of carbon, hydrogen and oxygen, known as carbohydrate, with release of oxygen into the atmosphere. *This is the most important chemical reaction in the living world.* When carbohydrate is combusted, including in a living thing, carbon dioxide and water are reformed and the stored solar energy released. This released energy, that came originally from the sun, is used to power activities in the living machine called life. Human beings, like all living things, are adapted to their different environments. The environments of the Earth's surface which humans inhabit are highly variable. This great environmental variation introduces great variation among human species, resulting to what are recognized as races;

Black, White, Brown and Yellow peoples of the world. These variations can occur along altitudes, latitudes or within forests, deserts, seas, etc. Each of these variations is tied to the use of energy and nutrients by living things. Nature employs a complex equilibrium system balancing act called *Optimality Principle* to maintain living things in the form they can use energy most efficiently in a given environment. The size, shape, colour, reproductive capacity of a variant of a living thing in a given environment is usually determined by energy use pattern and efficiency.

1.2 Complex Architecture of Life as Energy-driven Bio-machine

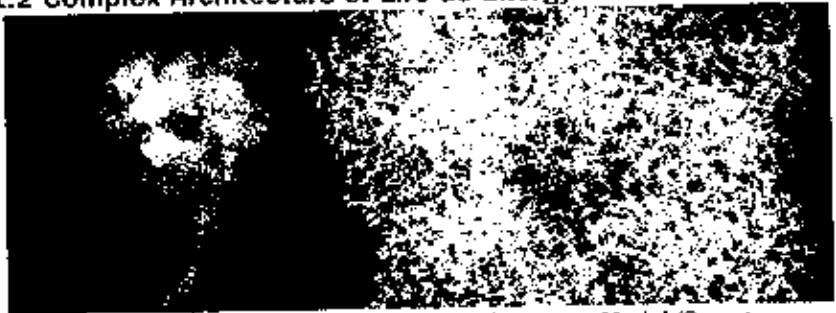


Figure 1. *The Architecture of Life as Computer Model* (Source: <https://www.bfi.org/dymaxion-forum/2019/01/architecture-life-described-computer-modeling/>).

The living system, as seen from the model on the architecture of life beyond what the ordinary eyes can see, is a hyper-complex system-of-subsystems. This self-assembling and self-remodeling assembly of elements are held together by, among others, what are called *Tensegrity Forces* (tensional integrity forces). Tensegrity forces are three-dimensional, very dynamic and responsible for easy change in shape and size, for instance, of living cells that are themselves subsystems that are aligned with other subsystems to form organisms (4). These are indeed ordinary properties of the *Ordering* of complex systems.

Consider the simple organic molecules *Hexene*, *Hexadiene*, and what would be '*Hexatriene*'. One has a double bond. The second has two double bonds. The third should have three double bonds. But the expected third does not exist at all. *Hexatriene* does not exist. In place of *Hexatriene* there exists a totally different, infinitely more complex, molecule than expected. This, surprising, new molecule is *Benzene* (see Fig. 2).

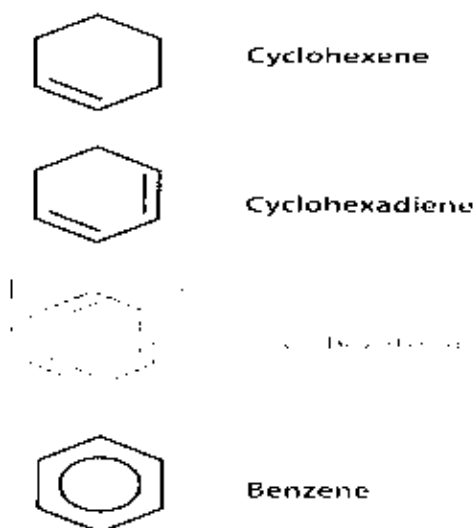


Figure 2: Benzene as Example of Self-organizing Multiple Equilibrium System.

A close look at the chemical properties of hexadiene shows that, like hexene, it undergoes mainly addition reactions. It takes up, as would be predicted, twice as much reagent as hexene. But benzene; one of the most unusual molecules in nature undergoes substitution reactions. It is so surprisingly super-stable that it took a while to account for its stability.

None of the three expected double bonds and three single bonds is observed in benzene. Instead what exists are bonds that have properties in-between double and single bonds, but stronger than the sum of both. The benzene molecule is said to be *resonance-stabilized* because of the delocalization of the electrons in the bonds. Benzene is an example of self-organizing equilibrium systems. Each bond is made up of two electrons moving with opposite spins; a kind of equilibrium, between two atoms.

Systems are elements in ordered arrangement. One rule of ordering things in systems, called permutation, teaches that the number of ways a given set of elements, n , like the double bonds can be arranged is equal to n -factorial; $n!$ So, one double bond can be arranged in only 1 way; two double bonds in 2 ways and three double bonds in 6 ways. If there were four double bonds, 24. Five double bonds could, in theory, be arranged in 120 ways. Generally, if ten elements, then $10! = 3,628,800$. The number of ways elements can be ordered, in any system, increases very rapidly as number of elements increases.

The basic element for the construction of a living system is the gene. A gene is a bio-switch; a regulatory biological control switch. The total pool of genes (bio-switches) contained by an organism is a *Genome*. The genome is the environmentally sensitive blue-print for the structural construction and functional regulation of an organism. Genes act by coding for proteins. Some of the proteins are enzymes. Enzymes catalyze; make processes more energy efficient, all the required construction and re-modeling activities of the body. For the human body there are about 20,000 genes in the genome (5).

Assuming 20,000 genes, then they can interact in 20,000! ways. The number of parts in equilibrium with each other, to make up the human body is quite enormous. The cell, which contains the genes, as far as scientists are concerned, is the basic organizational unit of living things. The cell has the basic attributes of a living thing, while genes are special chemical polymers.

1.3 Complex Systems Synergistics and Cells

What happened to transform what would be, structurally, non-remarkable hexatriene to remarkable benzene is the emergence of *Synergy*; the extra gain in energy efficiency and system stability that could not be accounted for by just summing the contributions of all the parts. Synergy is a property of the interaction of the elements of a system (6). The Igbo parable of the fragility of the broom-stick; which breaks easily, compared to the resilience of the broom-bunch; which no hand easily breaks, is just a lesson in synergetics.

In this day of climate change and extreme weather, one notices around the world that palms (oil-palm, coconut and other palm-trees) best withstand the storms. These palms have no gigantic taproots. They rather have numerous slender fibrous roots that act in concert; synergistically, to grip the soil. This force, which Igbo culture that has great paradigm commitment to synergetics, calls *Avutu* (*avutughu-avutu*; un-uprootable; invincible), and symbolized with the palm-tree, is fully exploited by *Nature* in the design of complex systems.

The ultimate natural system is the living system. The ultimate natural application of synergetics is, therefore, in the design of living systems. Synergy is the reasons living things are organized as aggregations of very large numbers of microscopic

cells; as the basic *biounits*, that can exist on their own, instead of as one large blocks of living mass. The multitudes of cells in a living thing is analogous to multitude of sticks in a broom-bunch or fibrous roots of a palm. They broke generate the efficiency and resilience called synergy. When a living system is deranged to grow fewer variety but larger cells, it is the pathological phenomenon called *Cancer*, which leads to the death of the organism.

1.4 Genetic Differences in Male and Female Humans and Energy Expenditure Variation.

There are two forms of the human body...the female and the male bodies. By definition, if there is no difference between females and males as to the number of genes, they would have the same level of systemic complexity and other associated qualities. But if there are differences in the number of genes, even a single gene difference; because of the factorial permutation law, would implicate very significant difference. In reality, female humans have about 800 genes in their extra X-chromosome, while males have 70 in their Y-chromosome (7). A number of logical conclusions can be drawn from defining human female and male body systems as like any other living system defined above, and with Fig. 1 on the architecture of life in mind:

1. Human females are, as systems, enormously more complex than males. This is because, as indicated, the organization of the female system is based on many more elements, genes, in ordered array. This would result, logically, in greater system complexity and synergy.
2. With greater dynamic equilibril capacity, and implied thermodynamic reversibility, energy flow through the female system would be slower than in males.

Therefore, males would be stronger expressers of directional energy, and females more thermodynamically efficient. The female menstrual cycle is the most visible manifestation of thermodynamic system reversibility in humans.

3. Females systems, because of greater inherent synergy, would need less energy to run than male systems. Females, as system, would therefore need less food intake than males. Females would more easily overfeed; suffer obesity, and males more easily starve with leaner mass.
4. Greater female system efficiency; less entropy, implies greater system stability. Human females, on aggregate, would expect longer life expectancy than males.

These surmises are in agreement with available data. Females, on average have a lower basal metabolic rate than males (8, 9). One study shows American females require about 1,400 calories, while males require 1,800 calories. (10, 11).

As females are smaller in mass, M , than males who also have a proportionately higher basal metabolic rate, BMR , in proportion to their larger mass ($BMR = kM$), relative energy need would be the product of these two functions:

Relative Basal Energy Need, $RBEN = \text{Basal Metabolic Rate, } kM \times \text{Mass, } M$.

$$RBEN = kM \times M = kM^2$$

Because of this relationship, whereas adult humans' female are about 90% the size of males, they require about 80% the food men need. Females, on average, move slower than males. For instance, the fastest 100 meters a man ever ran is 9.56 secs, while for a woman it is 10.49 secs. The average 100 meters records for men in six regions of the world is 9.86 sec, while the average for females is 10.8 sec

(https://en.wikipedia.org/wiki/100_metres). $9.86/10.80 = 0.91$. Women, on average, move about 10% slower than men (12). The World Health Organization, WHO, has just announced that females have a longer life expectation than males everywhere in the world (13). Other data agree. The differences in metabolic rates of males and females have for long being linked to differences in their relative life expectancies.

Table I: Male and Female Life Expectancies in Selected Countries (2010-2015)

COUNTRY	LIFE EXPECTANCY	
	Female	Male
Japan	86.8	80.5
Switzerland	85.3	81.3
Singapore	86.1	80.0
Australia	84.8	80.9
Spain	85.5	80.1
Sweden	84.0	80.7

Source: WHO, 2019.

From Table I, it is observed that the average female in these countries has a life expectation of 85.4 years, while the average male has 80.6 years. So, females, in this group, have $85.4/80.6 = 1.06$ or 6% more life expectation than the males. This difference is attributable to greater stability due to greater complexity and synergistic efficiency.

1.5 Biogeographic Laws of Human Diversity and Energy Expenditure Variation.

Over times and places, human beings have noticed that there exist varieties of their species; *Homo sapiens*. These varieties of *Homo sapiens* are noted by manifest differences in physical

appearance; size, colour, shape, hair, etc. Humans, at times, call these various forms of their species *races*. Races also exist among other species other than human. But humans are more concerned with their species, and are wont to create stories to rationalize their experiences, including the phenomenon of the existence of varieties of their species. As colour is the easiest of the differences to describe, the ideas of *Black, White, Yellow, Brown* etc., varieties or races emerged. It is surprisingly that when humans, in their folklores, wonder about racial differences among themselves, they don't also wonder about same in other species.

Modern science has developed demonstrable explanations for human, and other warm-blooded species, variations. The variations are explained in terms of different kinds of adaptations to the environment. For instance, they occur in response to solar intensity, humidity, oxygen pressure, etc. These explanations are encoded in a set of rules or laws called biogeographic or ecogeographic laws, which occur along latitudes and altitudes. That is, they apply as one moves from the equator towards the Earth's north or south poles and up or down mountains. These rules define how, approximately, mammals like humans vary in size, colour, shape and so on, from equator to the poles, in relation to varying climatic factors, altitude, etc. In each instance, these variations are tied to energy use; to food use and need.

The biogeographic rules include: i. Glogger's Rule. This rule states that as one goes from the equator to the poles, the body melanin content decreases. Living things, including people, tend to be dark coloured around the equator, and light coloured around the poles. ii. Bergmann's Rule states that the bodies of warm-blooded animals get bigger, from equator

poleward, as the climate gets colder iii. Allen's Rule states that limbs get shorter and thicker in relation to trunk from equator poleward iv. Hesse's Rule states that animals poleward have larger hearts in relation to their body compared to their equatorial variants. Etc. (14, 15, 16, 17, 18).

The importance of these rules is that their relationship to body energy use, automatically, links them to nutrition and diet, which is the main interest of this lecture. Take Glogger's Rule, as an example. From pole equator-wards, body melanin content increases. That is tropical animals, including man, are darker in colour than cold climate animals of the same species. On the other hand, colder climate animals require to generate and conserve more heat to keep warm than tropical ones. This imposes different dietary requirements on varieties of the same species in different environments. In other words, different human races have, inherently, different dietary requirements determined by the climates under which they exist. The amino-acid *Tyrosine* illustrates this critical point, in relation to the eco-geographic rules.

The metabolic transformation of *Tyrosine*, depending on the pathway followed, yields two important molecules that play opposing roles in animal energy metabolism. These are *Thyroxine* and *Melanin*. *Thyroxine* speeds up basic metabolic rate (BMR) of the body. *Melanin* slows down metabolism by scavenging free-radical that promote catabolism, and protects against sun's ultra-violet radiation damage of the skin and body. Fig. 3 illustrates these facts.

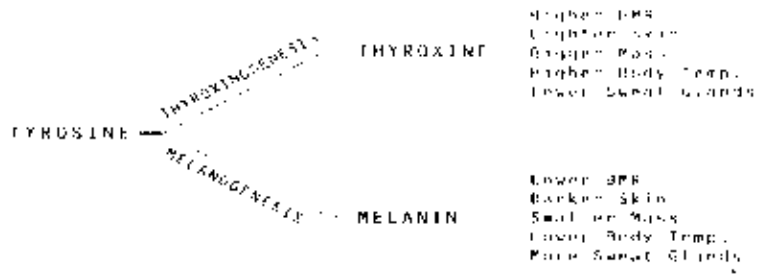


Figure 3. Tyrosine transformed into Thyroxine or Melanin Through Alternate Metabolic Pathways.

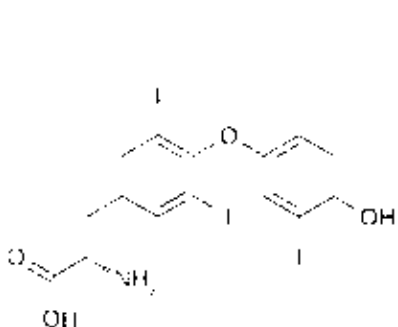


Figure 4a: Thyroxine

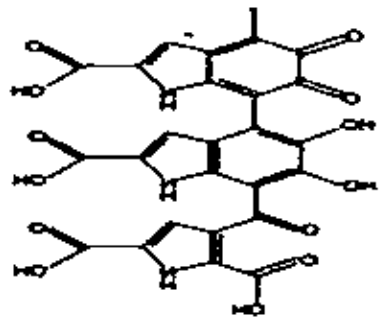


Figure 4b: Melanin

Just like males and females, energy and food need vary among the human races, because races are determined by environmental factors, that have energy implications or dependence. These biogeographic rules apply as a continuous phenomenon from equator to pole or up and down mountains and forests and deserts. Mediterranean North Africans (Berbers or Amazigh, for instance), are lighter coloured than tropical Africans. They are definitely much bigger in size than the pygmies, right at the equator. Because of their colder environment, the North African bodies would require more energy; more food per unit body mass, to maintain than the pygmies. This shows in the lower basal metabolic rates of tropical peoples, compared to temperate or cold climate peoples (18, 19). And because they have bigger body size than

pygmies, their relative overall energy need would be in square proportion to their size, M (Energy Need = kM^2), as between males and females.

By the same token, Italians and French in Mediterranean Europe are darker coloured and smaller in size than more poleward Germans or Scandinavians. The Scandinavian diet, compared to the Mediterranean, diet is known to be heavier in calories (20). Which is why the calorie-lower Mediterranean diet is usually recommended to those who would want to lose weight.

1.6: Biogeographic Laws Apply to Humans in Space.

Biogeographic or ecogeographic laws apply to altitudes, such as high mountains. As ones gets up the mountains, the temperature drops, oxygen gets thinner and humidity drops. This is analogous to; with respect to decreasing temperature and humidity, a move towards the poles from the equator. One then, logically, expects populations acclimatized to higher mountains to have less melanin than their neighbours down in the valleys. This is the case, and created confusion for 19th Century European travelers who met light skinned indigenous African peoples along mountain ranges (21). By the same token, travelling into space is a very extended move up and well above the peak of the mountains. The biogeographic law should apply.

The evidence is that it applies, as indicated by the NASA identical twin studies (<https://www.nasa.gov/twins-study>). The observed "included changes in telomere length, gene regulation measured in both epigenetic and transcriptional data, gut microbiome composition, body weight, carotid artery dimensions, subfoveal choroidal thickness and peripapillary total retinal thickness, and serum metabolites".

So, there were observed adaptive changes at the genetic, cellular, tissue, organ and whole-body levels after one year in space (22). Though most of the changes were, observably, reversed by re-adaptation to Earth environment, much longer stays would, logically, lead to more fundamental and irreversible changes or mutations. Very dark people with melanin rich skin; equatorial pygmies for instance, for reason of lighter weight, too, would be the ideal astronauts for long distance and long-term space travels, because of the high ultra-violet radiation in outer space.

These drastic adaptive changes are what routinely occur in nature; all the time, and supported by known laws of physics. Charles Darwin's attempt to account for the same phenomenon, over geologic times, led to his *Theory of Evolution*. Unfortunately, he infused a teleological (The idea of a unidirectional purposive, and perpetual, thrust towards the *improvement* of the species. Thought of the possibility of evolution without possibility of devolution is an unnatural thought; more philosophical than scientific) aspect into his theory:

"One general law, leading to the advancement of all organic beings, namely, multiply, vary, let the strongest live and the weakest die."

--Charles Darwin, *On The Origin of Species*, 1859; Castle Books edition, 2004—

His mechanism is unnatural, because it requires unavailable physics of irreversibility to bring about and sustain. Darwin's theory of evolution, in this sense, is a faulty; unnatural, theory. But science is that way; the theories are changing all the time, with better understanding of *Nature*. For instance, genes are

discrete particles that cause discrete, not gradual, changes as Gregor Mendel discovered after Darwin. Gene behavior would be better accounted for by *Quantum Physical* thinking than Newton's *Continuum Physics* of Darwin's time.

A problem that has risen from Darwin's erroneous physics assumption is the problematic of *'Missing links'*. There would, of-course, be no *missing links problematic* in discrete; quantum, transformations or transitions such as particles, like genes, can cause as expected. As long as energy flows in discrete quantities, all processes driven by energy would be quantized.

What is really going on can better be described as environmentally-driven *Biogeodynamic Transformation* and not *Evolution*. Because of the basic particulate; discrete; quantized, nature of the underlying genes, the normal form of the phenomenon Darwin thought of as *evolution-for-improvement* would be *Quantum Biogeodynamic Transformation*. This thinking would explain the 'missing links' (gaps in fossil records), the observed *punctuated equilibria* (23, 24), as well as allow living things transform in reverse direction if the physical conditions reverse.

One, logical, biogeodynamic implication of ongoing climate change; due to global warming, for instance, is that warm blooded mammals (endotherms), like the snowshoe-in-summer, would evolve towards less thyroxine production; more melanin production and darker bodies. Polar bear in currently cold arctic region of the world, for instance, would evolve towards smaller basal metabolic rate; more melanin-rich and darker skin; smaller body size, etc. On the other, should another ice-age occur, tropical endotherms would evolve

towards more thyroxine production; less melanin and lighter skin; bigger body mass and sweat glands, etc.

1.7: Human Energy Metabolism and Control

The particular chemical processes through which the body extracts energy and structural materials from food is *Metabolism*. From the argued differences above between males and females, as well as races, it is clear that there would be differences in intensity and patterns of metabolism between sexes and races. These differences are reflected in the indicated differences in basal metabolic rate or resting metabolic rates between races and sexes. With enormous capacity, as a hyper-complex system, of self-assembling and remodeling, the environment-sensitive human metabolic system is, itself, very complex. For energy extraction from food, the beginning are simple molecules; best represented by Glucose, $C_6H_{12}O_6$, and oxygen, O_2 . At the end are simple molecules; best represented by Carbon dioxide, CO_2 and water, H_2O , with energy as important by-product in this process called respiration:

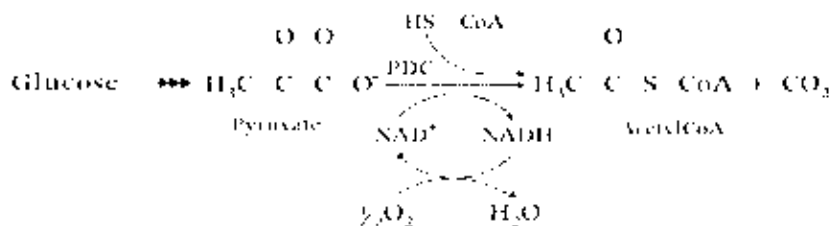


Figure 5: Pyruvate Dehydrogenase Complex (PDC); Major Metabolism Regulator Enzyme.

The pyruvate dehydrogenase complex, PDC, is the enzyme system; a complex protein coded for by linked genes, that converts pyruvic acid to AcetylCoA. AcetylCoA is the fuel burnt to generate most of the energy used by the body. The pyruvate dehydrogenase complex, PDC, is acted upon by thyroxine to regulate energy metabolism. It is, therefore, more active in people from temperate and cold regions with more thyroxine than tropical peoples. By the upregulation of its activity, PDC allows more pyruvate from glucose to be converted to energy in temperate and cold regions. On the other hand, by PDC down-regulation more pyruvate from glucose is converted to lactic acid among tropical peoples.

This PDC up-regulatory action allows temperate and cold climate peoples to process more food; generate more heat to stay warm and store enough fat under their skins for insulation. On the other hand, tropical peoples process less glucose into energy, but generate more organic acids; which makes their body fluids more acidic. With less fat covering their skins, tropical people have more sweat glands, etc., which helps to expel part of the excess body acidity and heat. Transepidermal water loss is greater in black skin than white skin. And skin surface pH is lower in black skin than white skin (25, 26). All these observations are, biogeodynamically, logical.

Racial (ethnic) differences in skin properties: the objective data.

(see Fig. 6). When the down-regulation of PDC goes too low, outside normal range, there is excessive build-up of un-metabolized glucose and organic acids (pyruvate and lactate) in the blood as observed in sicklecell anemia.

The better understanding and informed management of the pyruvate dehydrogenase complex; which is the linkage point of

the glycolytic cycle that breaks down glucose to pyruvate and the citric acid cycle that burns pyruvate to release more than 90% of the body energy, would be a boon to the healthful management of the human body. A derangement of the PDC leads to diseases, such as acidosis, anemia, diabetes, anergy, etc.

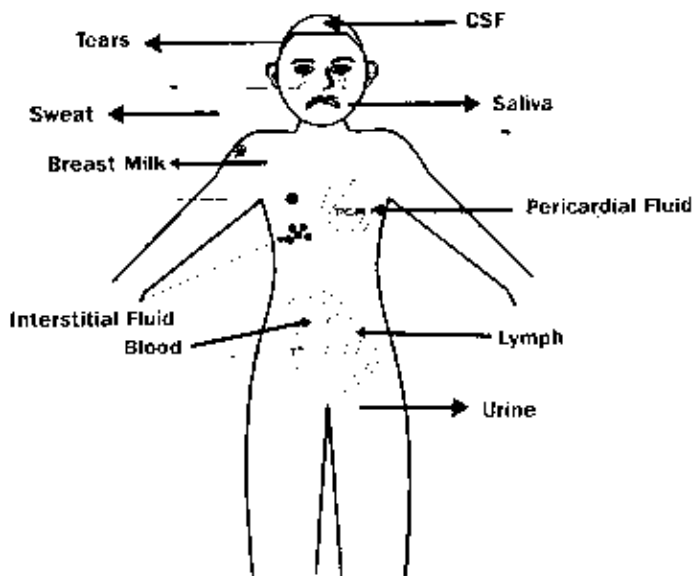


Figure 6: Body Fluids in Colour Codes; Blue are Alkaline, Internal, and Red Excreted Acidic.

The ideal blood pH of 7.4 and ideal urine pH of 6.6 represent underlying octahedral charge-packing structures (see Fig. 7). Any other charge-packing structure other than the ideal costs extra energy to maintain (27). This explains why acidosis or alkalosis are associated with anergy and general debility of the sufferer. At pHs at which polyhedral charge-packing cannot take place, death ensues. This is consistent with the optimality principle. The optimal state is preferred; more efficient and stable than the minimal or maximal states.

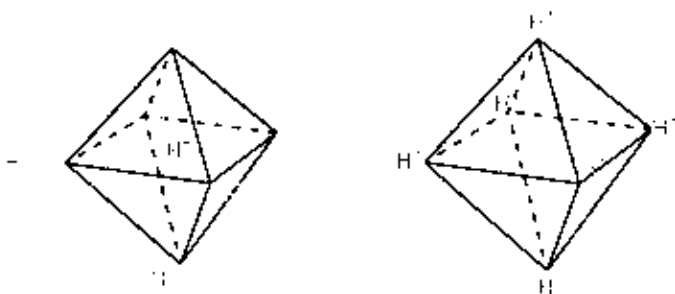


Figure 7: Octahedral Charge-packing of Bicarbonate and Hydrogen ions at pH 7.4 of Blood (left) and pH 6.6 (right) of ideal urine.

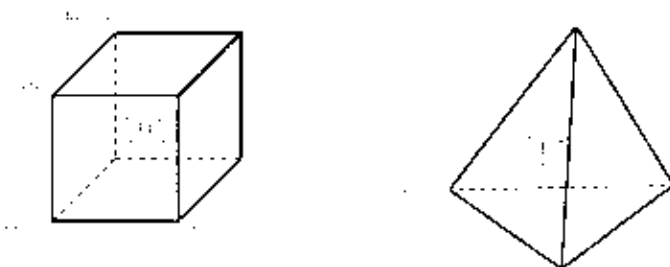


Figure 8: Polyhedral Charge-packing of Urine at pH 7.45 (left) and 7.30 (right).

2.0 YAM GENOMICS AND WEST AFRICAN CRADLE OF CROP DOMESTICATION

Very ancient peoples were thought to be hunter-gatherers. Those who thought out the idea of settling down at a place; of civilization, had to think out how best to feed and protect a settled community in a sustainable way. One marker of civilizations is the domestication of crops that can provide food for the people all year round. Centers where a given or set of crops were first domesticated are called 'cradles' of their domestication.

2.1 World Cradles of Crop Domestication.

The Mideast, called the *Fertile Crescent*, is the best publicized center of crop domestication in the world (28). The iconic crop of Middle-east fertile Crescent crop domestication is *Wheat*. But there are others; a key one in each major continent, as wheat represents Eurasian crop domestication. Each ancient cradle of crop domestication, and civilization, in the world has, also, a *flagship Crop* associated with it. Asia has rice; *oryza sativa* (29). North America has maize; *zea mays* (30). South America has potato and cassava; *Manihot esculenta* (31). In Africa, outside the Egyptian Nile valley that is regarded as the Middle-east fertile crescent, the other area regarded as a major cradle of crop domestication is the West African Niger basin. The flagship crop of the West African crop domestication cradle is the yam; *Dioscorea rotunda*.

2.2 “Yam Genomics Supports West Africa as a Major Cradle of Crop Domestication”

Above subheading is the title of a new major scientific finding about the domestication of yam in Africa. Genomics is ‘the science of the set of all-genes; the genome, of an organism’. The new science of genomics helps science to track the evolutionary history of organisms over time. These have helped scientists to track the genome of yam; *dioscorea rotunda*, and establish that it was domesticated in West Africa a very long time ago (32). Earlier, it had also been established that the African rice; and other grains had been domesticated in grassland West Africa, along the same Nigeria River basin (33). Potato is another important crop that was domesticated in South America (34).

African rice; *Oryza glaberrima* and pearl millet; *Cenchrus americanus*, have both been determined to have been

domesticated in the general area of today's Mali. With the establishment of yam domestication, West Africa has been confirmed as a major cradle of crop domestication and civilization. Yam has a special relevance to our lecture. it is the prime crop of Forest West Africa, domesticated by forest West African ancestors in ancient times. This is what makes forest West Africa the Yam belt that stretches from Cote D'Ivoire to Cameroun (see Figs. 9, 10). The West African Yam belt accounts for about 97% of total African yam production, according to United Nation's Food and Agricultural Organization (www.fao.org/ag/astat).

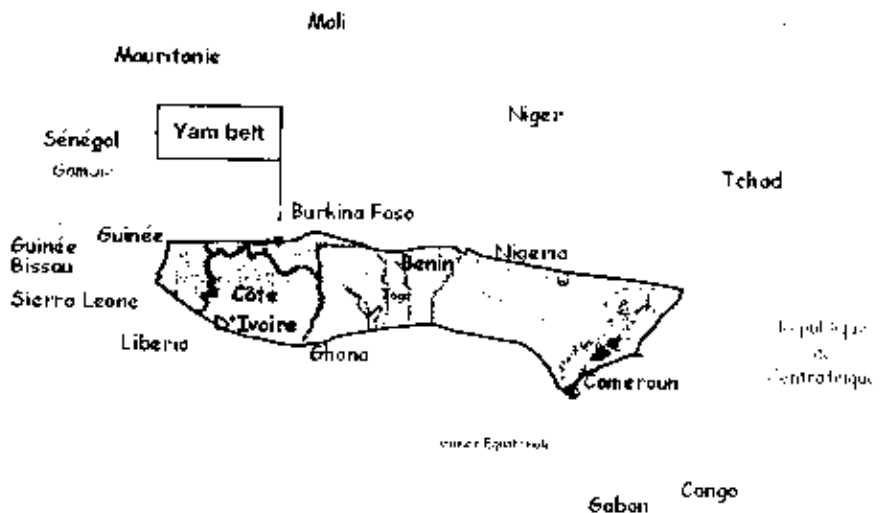


Figure 9: West African Yam Belt
 (Source: Biodiversityinternational.org)

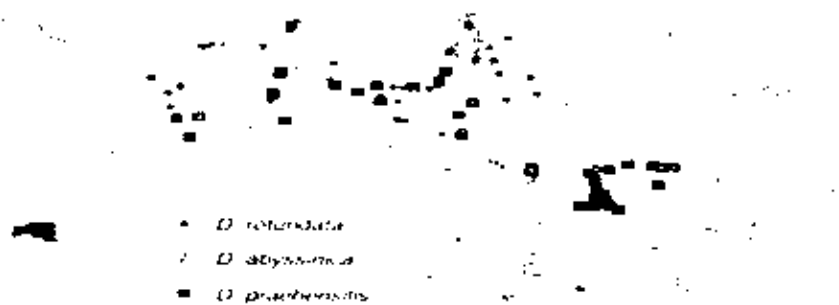


Figure 10: The West African Yam Genome Study Area
 (Source: Scarcelli et al, 2019).

So, the yam; *dioscorea rotunda*, is the main indigenous staple crop of Forest West Africa. It is, therefore, the main crop of interest of this study, in consideration of the indigenous diet of Forest West Africa.

2.3: Chemical Functional Essences of Yam as a Dietary Item.

From the biogeographic arguments, forest West Africans are tropical peoples. They have less need for energy generation to warm their bodies. So, they would not need fast-digesting, acidifying, food; with high glycemic index. Yam has moderate glycemic index. With lower metabolic rate, and greater need to cool, Forest West Africans need, on average, less food. With more acidic body, they would require a diet whose main staple would be alkalinizing. Yam is number 8 on Table II. The nutrient in which each staple crop excels in highlighted in bold on the table. Yam, as expected, excels in its content of the powerful alkalanizer mineral Potassium.

Table II: Some Basic Nutrients of Ten Selected Staple Crops

Nutrient	Maize (corn)	Rice, white	Wheat	Potatoes	Cassava	Soybeans, green	Sweet potatoes	Yams	Sorghum	Plantain	RDA
Water (g)	10	12	13	78	80	69	77	76	9	54	3,000
Energy (kJ)	1,528	1,528	1,369	322	670	615	360	494	1,419	511	0,388-10,480
Protein (g)	9.4	7.1	13.6	2.0	1.4	13.0	1.6	1.5	11.0	1.3	50
Fat (g)	4.74	0.66	1.54	0.09	0.28	5.8	0.05	0.17	1.3	0.17	44-77
Carbohydrate (g)	74	80	71	17	38	11	20	28	75	32	130
Fiber (g)	7.3	1.3	12.2	2.2	1.6	4.2	3	4.1	6.3	2.3	30
Sugar (g)	0.64	0.12	0.41	0.78	1.7	0	4.18	0.5	0	15	mir ma
Minerals											RDA
Calcium (mg)	7	28	29	12	16	187	30	17	28	3	1,000
Iron (mg)	2.71	0.8	3.19	0.78	0.77	3.55	0.61	0.54	4.4	0.6	8
Magnesium (mg)	127	75	126	23	21	65	26	21	0	37	400
Phosphorus (mg)	210	115	206	57	27	194	47	55	287	34	700
Potassium (mg)	287	115	363	421	771	620	337	816	350	499	4,700
Sodium (mg)	35	5	2	6	14	15	55	9	6	4	1,500
Zinc (mg)	0.21	1.03	2.65	0.29	0.34	0.90	0.3	0.24	0	0.14	11
Copper (mg)	0.31	0.27	0.43	0.11	0.10	0.13	0.15	0.10		0.09	0.9
Manganese (mg)	0.49	1.02	3.98	0.15	0.38	0.55	0.25	0.40	-	-	2.3
Selenium (µg)	15.5	15.1	70.7	6.3	0.7	1.5	0.6	0.7	0	1.6	55

2.3.1 Some Other Dietary Essences of Yam That Recommend It to Forest West Africans

Apart from quality as top alkalizer, yam has some other essential nutrients that are very suited to the Forest West African body system, such as:

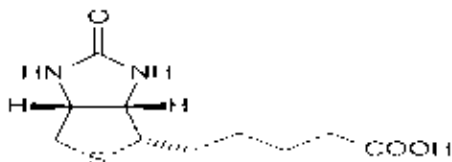


Figure 11: Biotin

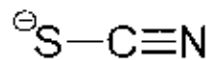


Figure 12: Thiocyanate

Table II: Some Basic Nutrients of Ten Selected Staple Crops

Nutrient	Maize (corn)	Rice, white	Wheat	Potatoes	Cassava	Beans, green	Sweet potatoes	Yams	Sorghum	Peanut	RDA
Water (g)	10	12	13	79	56	89	77	70	9	65	2,000
Energy (kJ)	1,528	1,528	1,365	322	670	615	350	494	1,415	511	6,388-12,460
Protein (g)	9.4	7.1	17.6	2.0	1.4	13.0	1.6	1.5	11.3	1.3	55
Fat (g)	4.74	0.65	1.54	0.39	0.26	8.8	0.05	0.17	3.3	0.37	44-77
Carbohydrate (g)	74	80	71	17	38	11	20	28	75	30	130
Fiber (g)	7.3	1.3	12.2	2.2	1.8	4.2	3	4.1	5.3	2.3	30
Sugar (g)	0.64	0.12	0.41	0.76	1.7	0	4.18	0.5	0	15	minimum
Minerals											RDA
Calcium (mg)	2	28	25	12	10	197	30	17	29	3	1,000
Iron (mg)	2.71	0.8	3.15	0.78	0.27	3.55	0.21	0.54	4.4	0.6	8
Magnesium (mg)	187	25	126	22	21	65	25	21	0	37	400
Phosphorus (mg)	210	115	268	57	27	194	47	51	297	34	700
Potassium (mg)	287	115	363	421	271	620	337	818	350	499	4,700
Sodium (mg)	35	5	2	6	14	15	55	9	6	4	1,500
Zinc (mg)	2.21	1.09	2.85	0.25	0.31	0.99	0.3	0.24	0	0.14	11
Copper (mg)	0.31	0.22	0.43	0.11	0.15	0.13	0.15	0.18	-	0.08	0.9
Manganese (mg)	0.49	1.09	3.96	0.15	0.39	0.55	0.23	0.46	-	-	2.3
Selenium (µg)	15.5	15.1	29.7	0.3	0.7	1.5	0.8	0.7	0	1.5	55

2.3.1 Some Other Dietary Essences of Yam That Recommend It to Forest West Africans

Apart from quality as top alkalizer, yam has some other essential nutrients that are very suited to the Forest West African body system, such as:

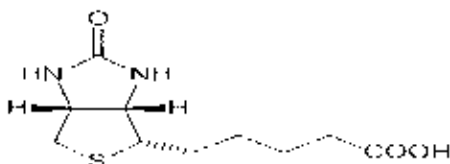


Figure 11: Biotin

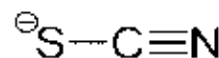


Figure 12: Thiocyanate

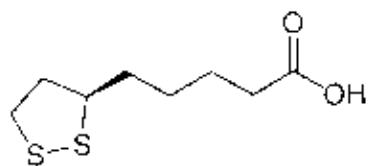


Figure 13: Lipoic Acid

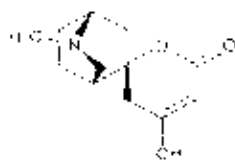


Figure 14: Dioscorin

With good 'chemical eyes', one notices that what all the above molecules that are essential chemical functions; nutrients, in yam have in common is richness in easy to release electrons. Apart from the many electron-rich double bonds, the two elements Nitrogen, N, and Sulphur, S, that are common in them are well known carriers of free electron pairs. Free electron-pairs are electrons that can easily be used to neutralize an acid. And they can be released in a modulated, stepwise, fashion. This is why both N and S can form multiple bonds as well as exist in multiple oxidation states. They are, like potassium, strong alkalinizing agents. So, the ancestral domesticators of yam had, in fact, picked the best possible crop out their environment for the acidic Forest West African body. That is not surprising, because the culture that relied on the guidance of the laws of Nature was a scientific civilization from the very beginning. When the people of the West African Yam Belt, annually, celebrate the Yam Festival in remembrance of the domestication of Yam, there is a great memory and achievement behind it.

2.4: The Palm and Other Companions Crops of Yam

There are three key nutrient types for the human body; *Carbohydrates, Fats and Protein*. In the more popular middle-east crop cradle they, as well as wheat as main source of carbohydrate, domesticated the olive for fat, cow for protein from milk and meat, etc. In the case of West African Forest, they domesticated the 'double-oil' palm (*Elaeis guineensis*); for

fat. As far as the world is concerned, the double-oil palm is the most important crop domesticated by forest West Africans. As the United Nations Food and Agricultural Organization describes the current global regard for it; for which Indonesia and Malaysia, among others, are destroying their primary forests to plant:

“Because of its economic importance as a high-yielding source of edible and technical oils, the oil palm is now grown as a plantation crop in most countries with high rainfall (minimum 1 600 mm/yr) in tropical climates within 10° of the equator” (35).

They domesticated fowls and ungulates (cattle, goats, pigs, sheep, etc), supplemented with fish, for protein. But protein from foliage; green leafy vegetables, made up a big part of the protein consumption among the Igbo of the Lower Niger.

2.4.1 The following are Some Main Nutritional Functions of Palm Oils

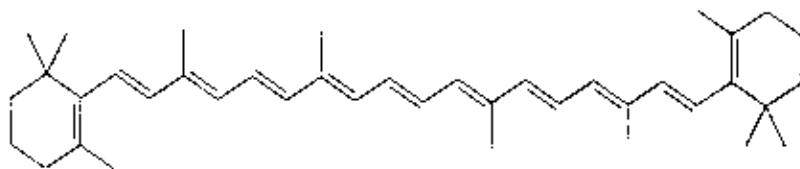


Figure 15: Beta-carotene

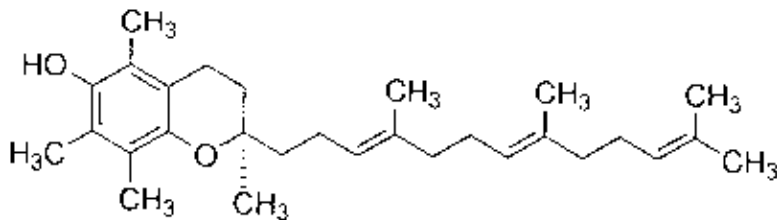


Figure 16: α -Tocotrienol

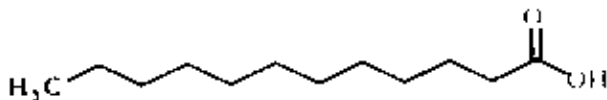


Figure 17: Lauric acid

2.4.2: Nutritional Functions from Leafy Vegetable Sources

Forest West Africans; particularly the people of Eastern Nigeria, are great consumers of leafy green vegetables. One obvious dietary chemical function from this source is folic acid, originating in green vegetables; foliage, by definition. Seasoning with pepper; *capsicum*, is a routine affair for seasonings. The active agent capsaicin is, therefore, consumed a lot (see figs. 18-20). But beyond that a great proportion of protein is sourced from vegetable sources (ref). The richest of the vegetables, *Uha*; *Pterocarpus milbraedi*, consumed as soup, has 26% protein by dry weight. Moreover, studies show that by amino-acid constitution, *Uha* protein is superior to soya-bean protein, which is known to be superior to beef protein. "The protein in *P. mildbraedii* (*Uha*) is higher in quality compared to those in soybean...cowpea" (36, 37). The relative quality of a protein is determined by the relative qualities of the amino acids with which the protein is made. It is also the richest in anthocyanin content of the regular green leafy vegetables of the region (38).

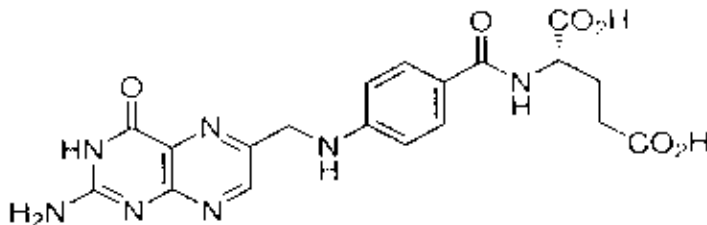


Figure 18: Folic acid

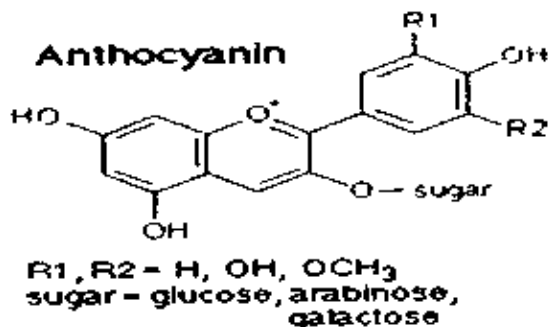


Figure 19: Anthocyanin: A Plant Melanin analogue

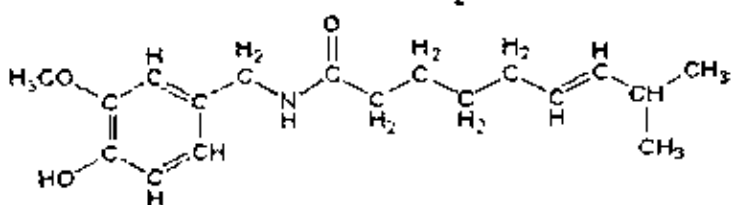


Figure 20: Pepper Capsaicin

2.4.3: The Special Case of Potassium Salt

Salt, usually sodium chloride (NaCl), is routinely used these days for food seasoning, by forest West Africans. This, as reported in his book (*The Interesting Narrative*, 1789), by Olaudah Equiano, has not always been the case. He reported that the Igbo got their salt from wood-ash (39). That would make the ancient Igbo; and likely other peoples of Forest West Africa, traditional users of potassium salts. Salts rich in potassium ions; K⁺. This is significantly the case, if one considers the wood-ash extracts employed in cooking hard-shell seeds and preparing puddings, like *Ugba* (oil bean salad), cassava and *Isiewu* (goat-head delicacy). But Equiano's observation is highly significant. Potassium is more alkaline than sodium, and so better for the acidic Forest West African body. Modern Africans, and their Diaspora, are known to have

poor relative capacity to excrete sodium, Na^+ , through his kidneys (40).

2.4.4: Forest West African Diet Is Highly Alkalinizing Diet.

A general overview of the forest *West African Diet*; from the staple yam (*Dioscorea spp.*) to the potassium-based salt for seasoning, suggests a general character of Forest West African Diet as *Highly Alkalinizing Diet*. A diet that would be, significantly, adaptable for peoples of the hot and humid tropical forests of the world. This is consistent with the fact that forest West Africans, themselves, have successfully adopted other tropical crops. Cassava (*Manihot esculenta*) and coconut (*Cocos nucifera*) are examples. The main physiological functions of Forest West African diet include, among others:

1. Alkalinizing (Powerful reducing agents).
2. Ketogenic (generates ketone bodies); replace glucose for brain/nerve metabolism
3. Bioelectrical Modulation e.g. Lauric acid.

2.4.5 Normal Forest West African Diseases

Like the rest of humanity, infectious diseases, particularly malaria, have been endemic with the Forest West African People for a long time. In addition, there is the unique, and more fundamental, genetic disease *Sicklecell Disease*. The evidence suggests that Sicklecell Disease (SCD) is a disease that came about as a result of genetic adaptation to the West African tropical forest environment. The two key stressors that brought about SCD among Tropical People are: i. Biogeographical or Ecogeographical Stress (hot, humid, environment with high solar irradiation, which required people to use metabolic energy in a particular way and have particular physiognomy, in order to function efficiently. ii. Zoonotic stress

(blood-feeding malarial parasites; *plasmodium spp*, that cannot thrive in more acidic blood, as in those that carry the gene, compared to those that do not carry the gene, but have less acidic blood). SCD is the great, genetic, nutritional and health marker of Forest West Africans (41).

A careful overview of tables III and IV in relation to Figure 5 on the metabolism of glucose; glycolysis, first to pyruvate. And then across the pyruvate dehydrogenase complex (PDC) of gateway enzymes that convert pyruvate to acetylCoA and respiration leads to the realization that the PDC is deranged in SCD as has been reported in the literature (42). The derangement of PDC results to build up pyruvic acid behind the PDC complex. Pyruvic acid and lactic acid are in a dynamic equilibrium that more favours conversion of pyruvic acid into lactic acid. So, both pyruvic acid and lactic acid build up in SCD (43); (see Table IV). The back-pressure builds up until glucose itself cannot be metabolized (see Table III). Sickie Cell Anemia can be considered a form of diabetes.

Table III: Plasma Glucose and Fructose Levels in Sickie Cell States.

SSickieCell State	Numberof Subjects In Group	PlasmaGlucose Level,mg/dl	PlasmaFructose Level,mg/dl
HbAA	35	70.10± 7.50	1.32± 0.08
HbAS	32	74.75±6.20	1.25±0.05
HbSS	34	78.59± 4.20	1.09±0.05
HbSSc	33	84.80±4.10	0.99 0.04

Table IV: Lactate and pyruvate levels in different sickle cell states.

SickleCellState	HbAA	HbAS	HbSS	HbSS-crisis
Lactate	0.74±0.	0.75±0.	27.60±1	31.40±2.5
Lactate ratio	1.00	1.01	37.30	42.43
PyruvateLevel,m	0.11±0.	0.11±0.	2.03±0.	2.08±0.11
Pyruvateratio	1.00	1.00	18.45	18.91
Lactate/pyruvate	7.01	7.02	13.60	15.07

This has the following, logical, adverse metabolic and health implications:

1. Sickle cell disease, SCD, sufferers cannot metabolize glucose well, which builds up in their system.
2. Sickle cell gene carriers are more prone to diabetes.
3. The metabolism of cells that depend solely on glucose; such as red blood cell and nerve cells, would be compromised in SCD sufferers. So, anemia and nerve problems such as stroke such would be more prevalent.
4. Because acetylCoA metabolism, which generates most of the body energy is compromised, anergy would be a generic problem.
5. The buildup of pyruvic and lactic acids, due to malfunctioning PDC, would result to metabolic acidosis and related syndromes.
1. The body, usually, converts excess lactate into fat; through the lactate shuttle. Forest West Africans, who build up lactate in their acidic body would, logically, be more prone to obesity and the metabolic syndrome associated with it in the presence of excess food.

On the positive side:

1. The acidic body of the Forest West African would not allow certain micro-organisms that are susceptible to destruction by acidic environments to thrive.
2. The malarial parasite; *plasmodium spp.* do not thrive in acidic, or electron-poor,

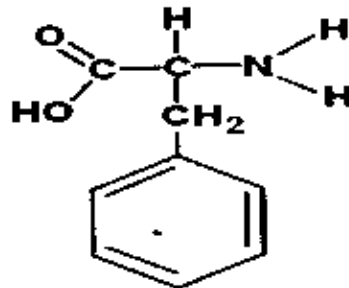


Figure 21: Electron-rich Phenylalanine

environment. So, forest West Africans would be more resistant to malarial attacks. That is as long as they do not buildup fat in their system on which the organism thrives (44). That explains why the electron-rich amino acid, *Phenylalanine* (see Fig 21) is used to treat SCD, but promotes cerebral malaria. On the other hand, the amino acid L-Arginine, which does opposite of what phenylalanine does; produces the powerful oxidizing agent, nitric acid, NO, and kills malaria parasites, is very low in the blood of severe malaria patients (45, 46, 47, 48). The active substance in the beans *Fiofio*; *Cajanus cajan*, fed to SCD sufferers to stabilize them, is phenylalanine. Generally, antisickling agents are reducing agents, while anti-malarials are oxidizing agents. An example of an oxidant used as antimalarial is the current most popular substance for malarial treatment; artemisinin (see Fig 22). It is a peroxide; an oxygen-rich molecule, like hydrogen peroxide; H₂O₂. It is the active oxygen it releases that kills the malarial parasite. Hydrogen peroxide is not used for the same purpose only because it will release the oxygen too fast, as to burn the cells. But other peroxides that release their oxygen at more appropriate rates or efficient formulations of oxygen could be

used, instead of importing oxygen compounds for malarial treatment.

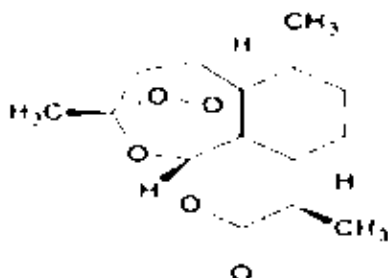


Figure 22: Artemisinin; A Peroxide Antimalarial Molecule

2.4.6: Optimality Principle of Body Metabolism and Redoxive Stress

The human body is powered by energy that originates in the oxidation-reduction (redox) reaction of the prime oxidant (oxygen) and prime reductant (glucose) of Earth's Biosphere. The reaction maintains the body in stable, eu-redox, state as long as oxidants, optimally, balance out reductants. In the simplest possible expression, electrons are transferred from the reductant glucose to the oxidant oxygen. For instance, in the water, H₂O, formed; the electron is seen to be transferred from the hydrogens pulled from the carbohydrate to oxygen: H₂O → H⁺ + OH.

So, H⁺ is the resulting oxidant and OH the reductant when the water molecule breaks-up into ions. With excess oxidant, there arises oxidative stress, and with excess reductant reductive stress. Either of these constitutes a redoxive stress. These would usually occur under opposite conditions. But they can, unusually, occur together in disease states in which tissue respiration is ineffectively coupled to glycolysis. Such a disease is sickle cell anemia. In this case extraction of reducing power, H⁺, from food is poor; acid, H⁺, builds up because of excess

production of lactic acid. But, generally, the excess of either oxidant or reductant (redoxants) induces redoxive stress (49). This relationship can be represented by the equation:

$$\mathbf{Sr} = \mathbf{k}[(\mathbf{r} - \mathbf{1})^2 + \mathbf{1}]$$

Where: **Sr** = redoxive stress; **r** = redoxant dose; **k** = proportionality constant.

Fig. 23 is a graphical illustration of redoxive stress. Excess acidity is stressful; a disease called acidosis. Excess reducing agent, alkaline, consumption results to a stressful disease called alkalosis. Just like underfeeding causes malnutrition; like kwashiorkor and overfeeding causes malnutrition disease; as obesity, moderation is advised. Optimum feeding is best for health.

When grandmothers advise against eating too much oils or groundnut; lest one caught malaria, they are addressing the fact that fats and oil-bearing food, including groundnuts, are packed with reducing/alkalizing power, like combustible hydrogen atoms, H° . Fasting would also reduce body fat, and reduce possibility of malarial infection. On the other hand, highly acidic bodies, like the body of sickle cell anemia sufferers, full of protons, H^+ , are highly oxidizing. People who engage in frequent rigorous exercise (gulping in lots of oxygen), would have better chance of avoiding malarial attack.

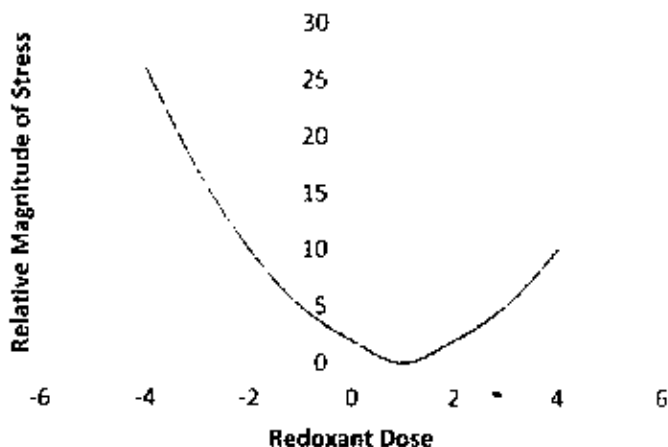


Figure 23: A Model of Redoxive Stress from Sicklecell Anemia Data
(Source: Osuagwu, 2009)

2.4.7: Albinism and Melanin Gene Downregulation

A common health problem that should be of interest to, particularly, the people of Eastern Nigeria is albinism. It is prevalent in the area, with some of the highest rates in the world. By extension, albinism is relatively high among African Americans, most of whose ancestors come from Forest West Africa (50). Melanin a powerful photo-protectant and free radical scavenger, is lacking in albinism (see Fig 4b). Evidence suggests that the mutation for this high prevalence in Eastern Nigeria might have been induced by the liberal and very long-time dependence on the abundant leafy vegetables and flowers, rich in anthocyanin, as part of their diet.

The genes that influence skin colour are so dynamic that some animals, e.g. North American snow-shoe hare (*Lepus americanus*), switch their fur colours with the seasons. They are, like tropical people, dark in hot and humid summer; and like cold climate people, white in the cold dry winter (51).



Figure 24: Snowshoe Hares; Dark in Summer (left) and White in Winter (right)
(Source: Wikipedia)

Fishes, salamander and other animals that live in dark watery caves; without exposure to solar ultraviolet, UV, radiation, also mutate to lose skin pigmentation. “The evolutionary responses (of cave fishes) converge on loss of eyes and pigmentation and the augmentation of other senses...as well as a more efficient metabolism...” (52). So, pigmented organisms removed from the stress of UV radiation evolve to lose their melanin producing capacity. This change in pigmentation is coupled to change in metabolism.

Experiments have shown that the melanin functional analogue in plants; anthocyanin, can induce albinism in experimental plants, by the inhibition of melanin synthesis. This is done by downregulating the gene that codes for melanin production (53, 54, 55).

2.4.8: Forest West African Adaptive Adoption of Foreign Foods

Noteworthy is what was done, in the case of these two important crop adoptions, is *Adaptive Adoption*. That is, these food crops were adopted as analogues* of food crops the people already had; and were genetically or epigenetically adapted to. That this is what was done can be seen in the names the people gave to these adopted crops. *Ji-apu/Ji-akpu*; Silk-cotton-tree (*Bombax ceiba*) yam for Cassava. That means cassava was adopted as analogue to yam. It turns out to be, as food material, quite similar to yam once people mastered the art of removing the excess cyanic acid that killed many people initially. Coconut is named *Aku-beke*; the Whiteman's palm-kernel. It was considered analogous to the local palm (*Elaeis guineensis*) kernel and employed for similar purposes as food. The most remarkable point about this most efficient adoption, in the case of coconut, is that the most important fatty acid constituent of both; lauric acid, is roughly half of the total fatty acid of their oils. This tradition of testing, *Ile-ute*, before food crop adoption is consistent with a scientific culture moderated by *Dibia*; the Medicine-men.

3.0 NON-ADAPTIVE FOREIGN DIET ADOPTION AND MODERNIZATION DISEASES

3.1 Circumstances Compelling Forest West African Adoption of Alien Diet

It is shown that, consistent with their tropical forest adapted physiology, Forest West Africans have a diet regime that is *alkalinizing*. This is efficient, as neutralizing factor, for their tropical acidic body system. The case has also been made that, because of the scientific base of their culture, they had a tradition of adaptive food adoption. In the last four hundred years, due to the trans-Atlantic slavery and European colonialism, Forest West Africans have been made to adopt the 'modernizing diet' of aliens. Evidence is that this new diet regime is inconsistent with Forest West African body type and good health.

3.2 Review of The European Diet Type

At the core of the European diet type is Wheat (*Triticum aestivum*) Bread of the Middle-east Fertile Crescent civilization. And with these dairy products, that are part of the mix, for protein. Oil comes mostly from olive (*Olea europa*).

When there is a liberal component of fruits and vegetables and fish significantly displaces beef, the classical *Mediterranean Diet* is realized. Other variations, like the Nordic diet; heavier in calories, for instance, exist. Nordic diet emphasizes canola oil more than olive and fatty fish more than meat (56). Wheat and milk are always there. And wheat and milk are at the heart of Forest West African crises of mal-adoption of European diet.

3.3 Wheat and Milk Diet Challenges to Forest West Africa.

The essentials problems of wheat and milk diet for forest West Africans come from 1. *Gluten opioids* in Wheat 2. *Lactose* in Milk and 3. *Casomorphin Opioids* in Milk. Fig. 25 shows the lactose molecule.

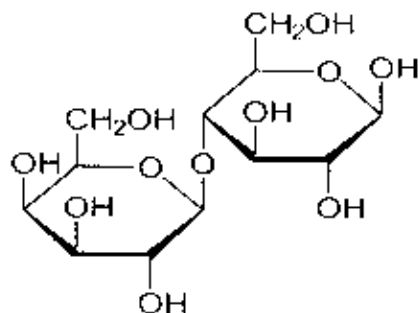


Figure 25: Lactose

A high percentage of the people of Forest West Africa cannot digest lactose because they lack the enzyme Lactase for digesting lactose. In a study Lactose tolerance was tested in four major ethnic groups in Nigeria.... "The data

indicate that 99% of the Yoruba and 96% of the Ibo after the age of 1½ to 3 years malabsorb lactose, whereas only 64% of the Hausa and Fulani show malabsorption. But nomadic Fulani, who are migratory cattlemen, show only 20% malabsorption." (57, 58). A study done in the United States the same year shows that overwhelming majority of African Americans are lactose intolerant (59, 60). This shows that this, otherwise normal genetic condition for non-baby mammals, cannot be reversed in a few generations of drinking milk and trying to adapt. The lactose intolerance rates among Asians is also high; reaching 90% (61).

Symptoms of lactose intolerance include:

1. Stomach Pain and Bloating.
2. Diarrhea.
3. Increased Gas in stomach.
4. Constipation.
5. Lower bowel inflammation.

The three health-hazardous proteins in wheat are:

1. Gluten
2. Wheat Germ Agglutinin
3. Amylase Trypsin Inhibitors.

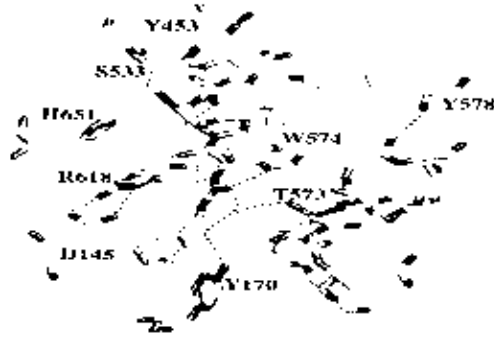


Figure 26: Gluten

Separately or together, the substances in wheat cause the following disease conditions:

1. Celiac disease (an immune response that damages the lining of the small intestine)
2. Gut inflammation
3. Increased intestinal permeability.
4. Wheat germ agglutinin induced inflammation.
5. Increased vulnerability to gut autoimmunity.
6. Increased vulnerability autoimmune diseases.
7. Damage to the gut biome.
8. Brain symptoms; brain fog and fatigue.
9. Skin symptoms; dermatitis herpetiformis.

The summary of all these is that toxic wheat substances comprehensively disrupts or destroys some peoples' immune systems, and much more. Googling 'Gluten Health Problems' yields 35,900,000 in 0.52 seconds (16/05/2019) of search. It is an issue of great interest and current discourse online. Wheat is a great crop, and main grain of the temperate peoples. Wheat is loaded with energy, nutrients and very high fiber content that is very good for the colon (62). It is best for those best adapted to it. That does not, apparently, include

Forest West Africans who are adapted to yams, fruits and leafy green vegetables. And who are more susceptible to gut diseases and the metabolic syndromes; e.g. obesity, diabetes and hypertension, associated with the *Wheat-Milk* diet of Eurocentric modernity (63, 64, 65).

3.4 Wheat and Milk as Agents of Modernization Diseases Afflicting Forest West Africa

It has been noted by an observer that "The history of wheat parallels the history of chronic disease and obesity across the world" (66). These chronic diseases are, now, more prevalent in Forest West Africans and their Diaspora. This is evident in the statistics for related metabolic syndrome. Obesity, diabetes, dyslipidemia, hypertension are metabolic syndrome related diseases, influenced by diet, as already indicated. The belly-fat associated with metabolic syndrome, which Nigerians call 'beer belly', has been called 'wheat belly' and 'gluten belly' (67).

It is noted that, independently, lactose in milk can cause lower bowel inflammation. Wheat, independently also, causes lower bowel inflammation. Taken together, as has become the breakfast culture of city-dwelling peoples across the world, the potential for lower bowel inflammation is compounded. This would be particularly the case with those whose traditional foods are not wheat and milk based. The evidence points to the validity of these surmises for Forest West Africans. Lower bowel inflammation, commonly mistaken for hemorrhoids or pile, is now endemic in West African cities. This is particularly the case with sedentary workers. This is a classic case of modernization disease, because this was not a serious health problem in West Africa before encounter with alien diet and sedentary professions. The anecdotal experience is that as

soon as someone afflicted by this 'pile' subtracts wheat (bread, cake, biscuit, etc.) and milk from their diet, the symptoms recede.

3.5 Diet and Gut Microbiota in Health and Disease

"An estimated 30 trillion cells in your body—less than a third—are human. The other 70-90% are bacterial and fungal. Ninety-nine percent of the unique genes in your body are bacterial. Only about one percent is human... So, it really shouldn't surprise us that the microbiome plays a major role in health, especially immunity and metabolism".

...Gaby D'Allesandro...

The gateway to the metabolism that occurs inside human bodies, is the digestive system of the gut. For a home, there is kitchen for cooking before dining hall for eating. For any human body, there is digestion in gut before metabolism in cells. Gut; the long tube from mouth through the intestines, with main workshop in the stomach, is the processor in which food is processed into absorbable nutrients for transport into the cells of the body for metabolism. The gut is like a refinery in which nutrients are distilled from food; for combustion in cells, just like petroleum refinery distills petrol from crude petroleum, for combustion in engines.

Until recently, modern science had treated the gut with less functional consideration than it deserves. That is changing rapidly. There is a new understanding of the biology of the gut, as well as of the essential roles of gut microbiota. The gut has been called the second human brain. The brain is made of about a 100 million neurons, and so has the gut. Moreover, the brain and the gut are joined by the two-way vagus nerve pathways. And it has been suggested that they are co-ordinate

in the control of human thought and feelings. That is the gut has been called the second human brain (68, 69).

Microbiota is the microbial flora harboured by normal individuals. Gut microbiota are the myriad, and diverse, microorganisms that populate the gut and play very significant, and diverse, roles in food digestion (70). The activities of normal gut microbiota are health-promoting. Abnormal microbiota can result to adverse health consequences of diverse kind. In contemporary medicine, health-promoting gut microbes called probiotics are, sometimes, given as supplements to create a more desirable balance of gut microbiota (71). Whenever the gut microbiota are compromised; such as occurs in obesity, the overall health of the body is compromised. Ordinarily, the gut is a food digester. But in abnormal situations; such as obesity, the gut can become, in addition to a digester, a fermenter; producing all kinds of abnormal substances, including anesthetizing methane, some of which are toxic (see Fig. 27).

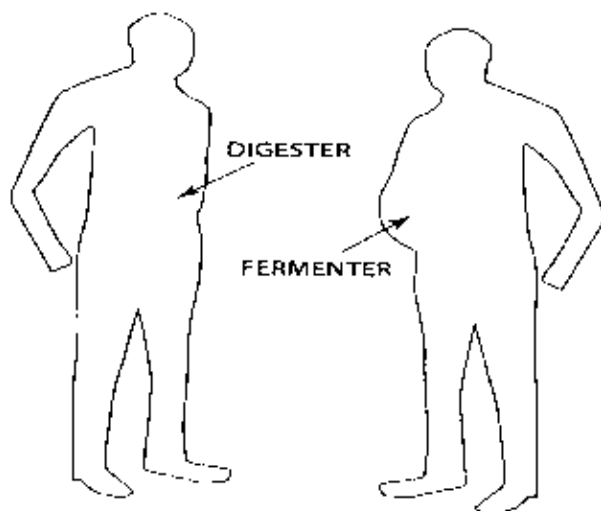


Figure 27: Normal Belly as Digester (left) vs Potbelly as Fermenter (right)

Gut microbiota are influenced by diet type and life style, like exercise etc. And they in turn influence diseases and their courses (72).

4.0 THE TRANSATLANTIC AFRICAN DIET LABORATORY AND MODERNIZATION DISEASES

The trans-Atlantic slave trade took Africans to the Americas, and Europe. This is also the uprooting of an African people from the 'Yam-palm oil-foilage' diet culture to a 'Wheat-meat-milk' diet culture. What this has created is a *Grand Diet Laboratory*; with tens of millions of subjects, that allows the study of the reaction of the Forest West African body type to alien diet, other than his adapted yam, foliage and palm oils. The studies are generating a lot of remarkable data from the Caribbean, the Americas and Europe.

One of the well-established findings is that Forest West African Diaspora suffer more from inappropriate diet and life-style induced metabolic syndromes than any other peoples (73, 74, 75). This is expected! This now helps explain what is happening to township-dwelling Africans who adopt the wheat-meat-milk dietary regime. Those in the Caribbean who consume a diet with more African component appear better off health-wise than, say, those in North America who have transited into more Western diet.

Researchers found: African-American children were sensitized to at least one food allergen three times more often than Caucasian children". "Asian and Black children were more likely to have a convincing history of food allergy" (76).

The Standard American Diet is European-American. It is alien to African and Asian body types; hence the greater allergic reactions to that diet by these tropical peoples. The general diet-related challenges, such as the greater prevalence of the metabolic syndrome; obesity, dyslipidemia, diabetes, hypertension, etc., observed among African Americans, can also be accounted for by the facts outlined above about differences in physiology synergizing with differences in historical diet cultures. When these syndromes appear among Forest West Africans, they are termed 'modernization' diseases. Perhaps '*de-civilization*' diseases would be more appropriate, for a people whose ancestors created a settled; civil culture, by the domestication of prime food crops.

4.1 Managing Modernization Diet Related Diseases Among Africans.

A remarkable experiment carried out by the University of Pittsburg points to the solution to modernization diseases; the metabolic syndrome particularly, among Africans. O'Keefe and his colleagues picked populations of African Americans and rural Africans and switched their usual diets for a period. "In this time, the Africans consumed traditional American food—meat and cheese high in fat content—while African Americans took on a traditional African diet—high in fiber and low in fat, with plenty of vegetables, beans, and commeal, with little meat". Unambiguously, the Africans started developing the usual diseases of African Americans, like colon cancer. The African-Americans on rural Africans' diet experienced healing, with measured remission of symptoms. It has to be noted that supplementation with folic acid; the potent reducing power supplier, used to manage SCD, had very positive effect (77, 78). Forest West Africans, away from the liberal supply of

green leafy vegetables, should supplement their diets with regular supplies of folic acid.

The logical inference is clear. If Africans, all over the world, go back to traditional African diet to which they are genetically adapted the problem of 'modernization' diseases; particularly the metabolic syndrome, among them will recede or disappear. For Forest West Africans a diet without wheat, milk and excess meat; but based on yam, the palm oils and green-leafy vegetables as base would, like the Pittsburgh University experiment demonstrated restore them to a healthier life. That is a life free from the life-shortening metabolic syndrome.

4.2 Folk Experience Had Anticipated Result of African Diet Switch Experiment

Equiano's book *The Interesting Narrative* (1789), had anticipated the difficulty African kidneys have excreting sodium. African kidney is adapted to potassium, which was the salt he reported the Igbo used. Among Africans Americans, the folklore still presents yam as an 'elixir'. Alice Walker's *The Color Purple* and Bell Hooks' *Sisters of The Yam* make the case. And so do stories from the West Indies (79, 80, 81).

In Walker's book, an episode is described, during the slave era, in which a little girl Henrietta was not thriving. The solution the African slaves knew was what was done in Africa with issues like that, which to feed the girl yam meals, by all means:

"Us do what you say the peoples do in Africa. Us feed her yams every single day. Just our luck she hates yams and she not too polite to let us know. Everybody for miles around try to come up with yam dishes that don't taste like yams. Us get plates of yam eggs, yam chitlins, yam goat. And soup. My God,

folks be making soup out of everything but shoe leather trying to kill off the yam taste."

-The Color Purple...Alice Walker (1982)

A commentator simplifies the language:

"Back home, Henrietta (Sofia's youngest daughter) is fighting for her life. The family is treating her illness the same way people in Africa treat it: with lots of yams".

The Igbo have a saying that backs the above observation; "Ihe eji ama mgbe ogwu ghere wu ji abanyere ya!; The sure proof that the boiling medicine is done is that the co-boiled yam is done!". This shows that, like among African Americans, yam was a standard component of Forest West African herbal preparations. Yam is key food as well as a key medicine. The highway to the restoration of Forest West African health from modernization diseases is planted on both sides with yams.

In her book *Sisters of the Yam* (1993), Bell Hooks presents The Yam as a magic wand; an instrument of Africans' holistic; mind, body and spirit healing. A return to yam, in effect, is a return to wholeness; a healthy and balanced life. The evidence points to the efficacy of this opinion. When it is recalled that Yam...*King of the Crops*, is the representative of all of Forest West African Agriculture and foods, then return to yam is also return to root of African adapted diet. That is what theory and experience recommend to cure Africans' imported modernization diseases.

4.3 More Reasons for Africans' Return to Dietary Roots.

The yam-based Forest West African civilization started about 3,000 BC with the Great Yam Experiment; according to the archeological records. This lecture will close by going back to

yam. We have seen two great African American writers; Alice Walker and Bell Hooks, say that the healing of the wounded Spirit of African people and Civilization will be powered by Yam or the Spirit of Yam. The yam narrative from the West Indies is no different. For the *King of Crops*, it is glorying all round.

They tell us Yam is a world-beater! They tell us that History's fastest man ever, Usain Bolt of Jamaica, is powered by Yam. A steroid in yellow yam, the University of the West Indies in Jamaica tells us, builds strong resilient muscles. And that is why Jamaicans sprinters are world's fastest. No wonder Jamaica has kept on the *Ohia-ji-oku* festival that celebrates the New Yam and the Spirit-of-the-Forest that produces it. Beside muscle-building steroids in yellow yam, there is Dioscorin. Dioscorin is the small, but precious protein of yam. It is the blue-green colored substance behind the skin of the yam. Uninformed people peel it off and go for the white of yam, without thinking of why the goat that knows better eats the skin of yam before the starchy core.

Some Chinese researchers have looked at what would happen to rat models of metabolic syndrome that afflicts the world, but particularly the Africans, are treated with dioscorin. Their finding: "Yam dioscorins exhibit improved metabolic syndrome activities in obese rats..." (82, 83). The same test carried out with dioscorin to test hypertension control proved efficacious (84).

Another function that makes yam (*dioscorea* spp.) a great functional food is thiocyanate. A study concluded that Sickie cell anemia is much more severe in African Americans than Africans on the continent because of the lack of adequate levels of thiocyanate in American diet. Whereas Africans get

adequate levels of this efficacious anti-sickling agent from yam (85).

A key point of reflection is Basden's observation that Igbo, indeed, had lots of cows when the Europeans arrived in the Lower Niger at the turn of the 20th Century. But they would not be persuaded to drink cow milk (86). When the British were about to leave Nigeria about sixty years later, there broke out an epidemic of diarrhea in the country. The children had been given milk powder at school. Parents withdrew their children from school, suspecting the British wanted to poison the children before leaving. Later in life, one learnt that it was the Americans, not the British, that brought the milk as gift to improve the protein intake of the school children. It is ironic, because in Igbo culture: "Odo n'agba afo wu ajo odo!" A gift that purges is a bad gift! Perhaps, if the Americans knew what the ancestors knew; that Forest West Africans are lactose intolerant, they would have done everybody a favour by keeping their milk at home. The best diet for any people is their, genetically and epigenetically, adapted indigenous diet.

5.0 SUMMARY

Forest West Africa is a primary cradle of crop; yam and oil palm, domestication in the world. Domestication of crops implies the establishment of settled, civil, life...*Civilization*. That also implies adaptation to the domesticated crop; at the genetic and epigenetic levels over millennia. The Forest West African is adapted to yam and associated crops. Transiting from this adapted dietary regime to one based on wheat and milk has created a public health crisis called the *Metabolic Syndrome*, for the African race all over the world.

Forest West African food type is characterized by food functions that are:

1. *Alkalizing (Powerful reducing agents).*
2. *Ketogenic; generates ketone bodies that replace glucose for neuron metabolism.*
3. *Bioelectrical Modulation.*

Like the famous Mediterranean diet, forest West Africa is the creator and custodian of a *Yam-palm Diet* that is best for her people and other tropical peoples. With return to a yam-palm based diet, to the exclusion of wheat and milk, the epidemic of the metabolic syndrome that currently ravages Forest West Africa, and her global diaspora, would be obviated or remediated.

References.

1. Margulis, L., and D Sagan (1995). What Is Life? Simon & Schuster, New York.
2. Iberall, F A S and McCulloch, W S. Homeokinesis - The Organizing Principle of Complex Living Systems.IFAC Proceedings Volumes. Volume 2, Issue 4, September 1968.
3. Que, C et al.Homeokinesis and short-term variability of human airway caliber. *Journal of Applied Physiology*; Vol. 91, No. 3.
4. Brownell, L. <https://www.bfi.org/dymaxion-forum/2019/01/architecture-life-described-computer-modeling>.
5. https://en.wikipedia.org/wiki/Human_genome
6. Fuller, R B (1982). Synergetics: Explorations in the Geometry of Thinking.Macmillan Pub Co, NY.
7. https://en.wikipedia.org/wiki/X_chromosome.
8. Wu, B N and O'Sullivan, A J.Sex Differences in Energy Metabolism Need to Be Considered with Lifestyle Modifications in Humans *Journal of Nutrition and Metabolism*.Volume 2011, Article ID 391809; 2011.
9. Buchholz A C et al. Is resting metabolic rate different between men and women? *Br J Nutr*. 2001 Dec; 86 (6):641-6.
10. Arciero, PJ et al. Resting metabolic rate is lower in women than in men *J Appl Physiol* (1985). 1993 Dec;75(6):2514-20.
11. Owen, O E. Mayo Clinic Proceedings; May 1988 Volume 63, Issue 5, Pages 503–510.
12. https://en.wikipedia.org/wiki/100_metres.

13. https://www.who.int/gho/mortality_burden_disease/life_tables/situation.../en/.
14. https://en.wikipedia.org/wiki/List_of_countries_by_life_expectancy.
15. Rastogi GK, Sawhney RC. Thyroid function in changing weather in a subtropical region. *Metabolism*; 1976 Aug;25(8):903-8.
16. Roberts DF (1953). "Body weight, race and climate". *American Journal of Physical Anthropology*. 11 (4): 533-558.
17. Ruff CB (1994). "Morphological adaptation to climate in modern and fossil hominids". *Yearbook of Physical Anthropology*. 37: 65-107.
18. Schreider E (1950). "Geographical distribution of the body-weight/body-surface ratio". *Nature*. 165 (4190): 286. Bibcode:1950Natur. 165..286S.
19. Roberts DF (1978). *Climate and Human Variability* (2nd ed.). Menlo Park, CA: Cummings.
20. Leech, J. The Nordic Diet: An Evidence-Based Review. <https://www.healthline.com/nutrition/the-nordic-diet-review>. 27 February, 2019.
21. Robinson, MF. A Theory You've Never Heard of and How It Changed the World. <https://www.youtube.com/watch?v=gn4bvjMh4vc> (TEDxUniversityofHartford).
22. Francine E. Garrett-Bakelman, et al. *Science* 12 Apr 2019; Vol. 364, Issue 6436, eaau8650.
23. Eldredge, N and Gould, SJ; Punctuated Equilibria: An Alternative to Phyletic Gradualism. In *Models in Paleobiology*; TJM Schopf, ed. Freeman, Coopers and Co (1972), San Francisco.

24. Rhodes, FT. Gradualism, Punctuated Equilibrium and the Origin of Species. *Nature*; vol 305. 22 September, 1983.
25. Maibach, HI and Wesley, NO. Racial (Ethnic) Differences in Skin Properties: The Objective Data. *Am J Clin Dermatol*. 2003;4(12):843-60. February, 2003.
26. Girardeau-Hubert, S et al. Reconstructed Skin Models Revealed Unexpected Differences in Epidermal African and Caucasian Skin. *Scientific Reports* 9(1):DOI: 10.1038/s41598-019-43128-3.
27. Osuagwu. Polyhedral charge-packing.*
28. Simcha Lev-Yadun, Avi Gopher, Shahal Abbo. the cradle of agriculture lay within a small region of the Fertile Crescent...began in the 7th millennium B.C. *Science* 288(5471):1602-1603 · June 2000.
29. Peter Ceván, Hayley Craig, Cymon J. Cox & Terence A. Brown. Three geographically separate domestications of Asian rice. *Nature Plants* volume1, Article number: 15164 (2015) 02 November 2015.
30. Logan Kistler, et al. Multiproxy evidence highlights a complex evolutionary legacy of maize in South America *Zea mays*.
31. Dolores R. Piperno. The Origins of Plant Cultivation and Domestication in the New World Tropics Patterns, Process, and New Developments. *Manihot esculenta*, *Current Anthropology* Volume 52, Supplement 4, October 2011.
32. Nora Scarcelli, et al. Yam genomics supports West Africa as a major cradle of crop domestication. *Science Advances* 01 May 2019: Vol. 5, no. 5, eaaw1947.
33. Philippe Cubry et al. The rise and fall of African rice cultivation revealed by analysis of 246 new genomes. *Current Biology*, July 5th 2018.

34. Michael A. Hardigan, et al. Genome diversity of tuber-bearing *Solanum* uncovers complex evolutionary history and targets of domestication in the cultivated potato. *PNAS* November 14, 2017 114 (46) E9999-E10008.
35. FAO. www.fao.org/3/y4355e/y4355e03.htm.
36. Akinyeyea, R O et al. Proximate, Mineral, Anti-Nutrients, Phyto-Chemical Screening and Amino Acid Compositions of the Leaves of *Pterocarpus Mildbraedi* Harms. *Electronic Journal of Environmental, Agricultural and Food Chemistry*.
37. Onyeka E. U. and Nwambekwe, I.O. Phytochemical profile of some green leafy vegetables in South East, Nigeria. *Nigerian Food Journal*, Vol. 25, No. 1, 2007, pp. 67-76
38. Akpanyung EO1, Udoh AP, Akpan EJ. Chemical composition of the edible leaves of *Pterocarpus mildbraedii*. *Plant Foods Hum Nutr*. 1995 Oct;48(3):209-15.
39. (Equiano, O. (Paul Edwards, ed, 1967). *Equiano's Travels: The Interesting Narrative of the Life of Olaudah Equiano or Gustavus Vassa the African*. London, Heinemann.
40. Weinberger MH. Racial differences in renal sodium excretion: relationship to hypertension. *Am J Kidney Dis*. 1993 Apr;21(4 Suppl 1):41-5.
41. Osuagwu, C G. Elevated System Energy Expenditure in Sickle Cell Anemia. (February 29th 2012). Anemia; Donald S. Silverberg, *IntechOpen*, DOI: 10.5772/31287.
42. Gregory J. Kato, Seyed Mehdi Nouraie, and Mark T. Gladwin. Lactate dehydrogenase and hemolysis in sickle cell disease. *Blood*. 2013 Aug 8; 122(6): 1091–1092.

43. Osuagwu, C G. Primary Pyruvate Acidosis in Sickle Cell Anaemia. *Nigerian Journal of Biochemistry and Molecular Biology*. 24 (2): 48 - 51, 2009. ISSN 0189-4757.
44. Mohanty S, Mishra SK, Das BS, Satpathy SK, Mohanty D, Patnaik JK, Bose TK. Altered plasma lipid pattern in falciparum malaria. *Ann Trop Med Parasitol*. 1992 Dec;86(6):601-6.
45. Fuchs S, Behrends V, Bundy JG, Crisanti A, Nolan T. Phenylalanine metabolism regulates reproduction and parasite melanization in the malaria mosquito. *PLoS One*. 2014 Jan 7;9(1): e84865.
46. Bert K. Lopansri, et al. Elevated Plasma Phenylalanine in Severe Malaria and Implications for Pathophysiology of Neurological Complications. *Infect Immun*. 2006 Jun; 74(6): 3355–3359.
47. Enwonwu, et al. Hyperphenylalaninaemia in children with falciparum malaria. *QJM: An International Journal of Medicine* 92:495-503;1999.
48. Bert K. Lopansri, et al. Elevated Plasma Phenylalanine in Severe Malaria and Implications for Pathophysiology of Neurological Complications. *Infect Immun*. 2006 Jun;74(6):3355-9.
49. Osuagwu, CG. Oxidative Stress: Sickle Cell Anemia as Model. Invited Paper to the International Union of Biochemistry and Molecular Biology Congress on Stress. Marrakesh, Morocco, April 2009.
50. Mounir Bashour. Albinism. *Medscape*. <https://emedicine.medscape.com/article/1200472-overview>.
51. https://en.wikipedia.org/wiki/Snowshoe_hare (retrieved 12 May, 2019).
52. <https://en.wikipedia.org/wiki/Albinism>.

53. Zhou Zhou, et al. Tyrosine Induces Anthocyanin Biosynthesis in *Arabidopsis thaliana*. *American Journal of Plant Sciences*; Vol.5 No.3, February 2014.
54. Hwang JM, et al. Inhibitory effect of liposome-encapsulated anthocyanin on melanogenesis in human melanocytes. *Pharm Biol.* 2013 Aug;51(8):941-7.
55. Graham S Timmins, et al. Le rouge et le noir: Are anthocyanins plant melanins? *Advances in Botanical Research* · January 2002
56. Åsgård, R et al. High intake of fruit and vegetables is related to low oxidative stress and inflammation in a group of patients with type 2 diabetes. *Scand J Food Nutr.* 2007 Dec; 51(4): 149–158.
57. Norman Kretchmer et al. Intestinal absorption of lactose in Nigerian ethnic groups. *The Lancet* 2(7721):392-5 · September 1971.
58. Olikoye Ransome-Kuti et al. Absorption of lactose by various Nigerian ethnic groups. *Pediatric Research* 5, 388–389 (1971).
59. Paige DM, et al. Lactose malabsorption and milk rejection in Negro children. *Johns Hopkins Med J.* 1971 Sep;129(3):163-9.
60. Cardell, N S and Hopkins, M M. The Effect of Milk Intolerance on the Consumption of Milk by Slaves in 1860. *The Journal of Interdisciplinary History.* Vol. 8, No. 3 (Winter, 1978), pp. 507-513.
61. Alford, S C. Lactose Intolerance in Asians. *Nature*; volume 221, pp. 562–563;1969
62. Manning, A P, et al. Wheat fibre and irritable bowel syndrome. A controlled trial. *Lancet.* 1977 Aug 27;2(8035):417-8.

63. Brar, P et al. Celiac disease in African-Americans. *Dig Dis Sci*. 2006 May;51(5):1012-5.
64. Hall, WD et al. The Metabolic Syndrome in African Americans: a review. *Ethn Dis*. 2003 Fall;13(4):414-28.
65. Clark, LT and El-Atat, F. Metabolic syndrome in African Americans: implications for preventing coronary heart disease. *Clin Cardiol*. 2007 Apr;30(4):161-4.
66. Hyman, M. Three Hidden Ways Wheat Makes You Fat. <https://drhyman.com/blog/2012/02/13/three-hidden-ways-wheat-makes-you-fat/>.
67. Schweitzer, L. Wheat Belly. <https://www.webmd.com/diet/a-z/wheat-belly-diet-review>.
68. O'Mahony, SM et al. Serotonin, tryptophan metabolism and the brain-gut-microbiome axis. *Behavioral Brain Research*. 2015 Jan 15; 277:32-48.
69. Robertson, R. "Food Foot Thought": How Your Belly Controls Your mind. <https://www.youtube.com/watch?v=awtmTJW9ic8>.
70. Collado, MC et al. Distinct composition of gut microbiota during pregnancy in overweight and normal-weight women. *Am J Clin Nutr*. 2008 Oct; 88 (4):894-9. <https://www.webmd.com/digestive-disorders/what-are-probiotics#1>.
71. What are Probiotics?
72. Rosean, CB et al. Pre-existing commensal dysbiosis is a host-intrinsic regulator of tissue inflammation and tumor cell dissemination in hormone receptor-positive breast cancer. *Cancer Research* (2019); 7 May, 2019.
73. Hilliard, C. Overweight African-Americans May be Addicted to Opioids in Wheat-Gluten. <http://soul-wisdom.blogspot.com/2012/01/overweight-african-americans-suffer.html>.

74. Saab, K R et al. New Insights on the Risk for Cardiovascular Disease in African Americans: The Role of Added Sugars. *J Am Soc Nephrol*. 2015 Feb; 26(2): 247-257.
75. Kiple, K and Kiple, V. The African Connection: Slavery, Disease and Racism. *Phylon*; Vol. 41, No. 3 (3rd Qtr., 1980), pp. 211-222.
76. Gupta, R S et al. The Prevalence, Severity, and Distribution of Childhood Food Allergy in the United States. *Pediatrics*, 2011; DOI: 10.1542/peds.2011-0204.
77. O'Keefe, S J et al. Fat, fibre and cancer risk in African Americans and rural Africans. *Nat Commun*. 6:6342. 28 April, 2015.
78. Chan, Y M et al. Switching to a fibre-rich and low-fat diet increases colonic folate contents among African Americans. *Appl Physiol Nutr Metab*. 2019 Feb;44(2):127-132.
79. Walker, A (1982). *The Color Purple*. Harcourt Brace Jovanovich. San Diego.
80. Hooks, B (1993). *Sisters of the Yam: Black Women and Self-recovery*. South End Press©1993; Boston, MA.
81. *Jamaican Observer*. Prof Morrison tells why Jamaicans run so fast: Yam and Bananas. Tuesday, July 26, 2011. http://www.jamaicaobserver.com/sport/Prof-Morrison-tells-why-Jamaicans-run-so-fast_9306187.
82. Shih, S et al. Effects of yam dioscorin interventions on improvements of the metabolic syndrome in high-fat diet-induced obese rats. *Botanical Studies; Bot Stud*. 2015 Dec; 56: 4.
83. Wu, G et al. 135-Day Interventions of Yam Dioscorin and the Dipeptide Asn-Trp (NW) To Reduce Weight Gains and Improve Impaired Glucose Tolerances in High-Fat Diet-

- Induced C57BL/6 Mice. *J. Agric. Food Chem.* 2018, 66, 3, 645-652
84. Hsu, F et al. Both Dioscorin, the Tuber Storage Protein of Yam (*Dioscorea alata* cv. Tamong No. 1), and Its Peptic Hydrolysates Exhibited Angiotensin Converting Enzyme Inhibitory Activities *J. Agric. Food Chem.* 2002, 50, 6109–6113 610.
85. Agbai, O. Anti-Sickling Effect of Dietary Thiocyanate in Prophylactic Control of Sickle Cell Anemia. *J Natl Med Assoc.* 1986 Nov; 78(11): 1053–1056.
86. Basden, GT. Notes on the Ibo Country, Southern Nigeria. *The Geographical Journal*; Vol. 65, No. 1 pp. 32-41; January, 1925.

