Hereditary Effects of Parental Lifestyle on the Health of Offspring

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Are My Grandparents to Blame?

By

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"Of dire concern, recent reports and news in the popular press have suggested that the current new generation will be the first to have a decreased life expectancy compared to their parents."

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PROLOGUE

It has been suggested that the experiences we encounter before birth can influence our health and well-being later in life. It may also impact on our susceptibility to disease, our intelligence and the kind of person we are going to be for the rest of our lives. This means that our health and quality of life are determined in the womb by circumstances that are often the consequence of the lifestyle of our parents and even grandparents. Much of the information around the effect of lifestyle of the parents and grandparents on the future health of their offspring is not known by the ordinary citizen. Although a lot of research has been done, and many articles and books have appeared, this is a relatively new field of study which exposes how the way of life of parents and grand-parents in the Western world impact on the future health of their offspring and the consequences for families and even countries in the longer term.

Epidemiological studies are vital in determining the causes of diseases, such as those that are associated with lifestyle. Over the last couple of years epidemiological studies clearly showed that lifestyle induces several non-communicable diseases, such as coronary heart disease, non-insulin dependent diabetes mellitus, asthma and chronic obstructive pulmonary disease (COPD). The outcomes of the epidemiological studies stimulated the interest of various researchers and research groups on the impact of the various social and economic factors as determinants of disease. The outcomes of these studies resulted in coining the foetal origins of adult disease (FOAD) hypothesis. This hypothesis suggests that some chronic illnesses that are experienced in adult life are already induced during prenatal development. There is also strong evidence which suggested that the lifestyle of the parents and changes in the mother's body composition at conception may induce "programming" of the foetus after conception to develop diseases later in life.

Despite the initial controversies around this hypothesis, it is now generally accepted. The knowledge gained with epidemiological studies is mostly also confirmed by findings from controlled experimental studies. These studies showed that "programming" of foetal cell metabolism as well as foetal cell structure and function is due to changes in genetic and

epigenetic make-up of the foetus and new-born during specific phases of development. If increased risk for adult disease is a direct consequence of irreversible structural and metabolic changes that are induced during gestation, it will have implications for public health interventions. If changes in metabolism, structure and function in the foetus that are induced during pregnancy are permanent, the opportunity for intervention is limited to the nine months of pregnancy. It has been suggested that an intervention which entails, for example, promoting healthy eating habits of mothers, or even, when necessary, prescribing supplements, the intervention may prevent "programming" and the foetal origin of adult disease. Healthy lifestyle habits must be promoted. This means not only promoting healthy eating habits, but also refraining from other lifestyle habits such as smoking and drinking.

Healthy lifestyle factors includes never smoking, a BMI lower than 30, engaging in physical activity for around 3 to 3.5 hours or more per week, and healthy dietary habits. This implies that healthy living is the only way to ensure not only the health of the parents, but also the health of their descendants for generations to come. This is of particular importance because the descendants of the grandparents and parents have no choice and is dependent on wise lifestyle choices of the grandparents and parents for their future health.

Since nutrition plays such an important role in all societies, the main aim of this book is to take a look at nutrition as part of a lifestyle of the parents or grandparents that influences the future health of their descendants. In more affluent societies lifestyle choices are easy and therefore it is important to make wise lifestyle choices. On the other hand, in poor societies the choices are indeed very limited. This makes it hard for parents to make wise choices, because the only real choice is to survive. This means that government at various levels and society and business at large must take responsibility to improve the living conditions of the desperately poor, in order for their descendants to have good health when reaching adulthood.

The problem at hand is that obesity is not the only problem of the parent, or the offspring. The most worrying effect is that over-nutrition and the associated obesity, induces an increased susceptibility to diseases in adult life in the offspring. This can be transferred between generations, with an increase in diseases such as type-2 diabetes, even if the offspring live a healthy life. There is good reason to believe that the severe increase in

obesity and diabetes mellitus can partially be ascribed to “programming” of the foetus during pregnancy as a consequence of wrong lifestyle choices by their grandparents and parents.

It has been noted that the increasing prevalence and severity of childhood obesity may reverse the modern era's steady increase in life expectancy, with today's youth on average living less healthy and ultimately shorter lives than their parents. The first such reversal in lifespan in modern history appears imminent unless the causes can be reversed. Such a possibility makes obesity in children an issue of utmost public health concern. This observation is supported by the fact that deaths attributed to obesity are only overshadowed by deaths related to smoking. These deaths are actually preventable, provided that our lifestyles are adjusted.

In this book I tried to address the influence of the lifestyle of the mother and father, and even of the grandparents, on that of the descendants, as well as the consequences for the descendants and the country. I also venture into possible solutions to the problem of foetal onset of adult diseases in the future. The latter is not a comprehensive plan, but just an effort to get people to think of how to change a wrong lifestyle to a healthy lifestyle, to the benefit of all.

CHAPTER ONE

HEALTH PROMOTION: AN EVOLUTIONARY PERSPECTIVE FROM STONE AGE TO SPACE AGE

"Pregnancy is a time of constant change as the new baby develops in the mother's womb. However, have you considered that the food the mother eats during pregnancy can affect her child's health even decades later? Understanding such 'nutritional programming' may help prevent diet-related diseases early on".[1]

Health awareness

Health awareness is widely addressed by the visual and written media. This is supposed to promote health awareness and health in general. On the contrary many of the health advertisements, as well as nutritionists, are actually not promoting health but creating false perceptions of health and health promotion. The general public is bombarded with advertisements featuring weight reduction programmes and programmes that will protect the user against disease. Often it promotes the use of dietary supplements and weird concoctions. Claims of success are made by advertisers that are often questionable. Although some of these advertisers claim that the product that is advertised is developed in a scientific way, or even with the help of clinicians these claims are indeed very suspicious.

Despite increased awareness and much improved health systems and practices, the incidence of certain diseases, such as type 2 diabetes mellitus and cardiovascular diseases actually increased drastically over the past number of years. These diseases are essentially caused by the way in which people live their lives today and are preventable. Preventable disorders and the associated costs to the individual and country, cause up to 70% of the burden of illness in America. In some studies it was pointed out that individuals with high risk habits have annual medical claims eight times those of individuals with low risk behaviour. Since the lifestyle

habits of South Africans show the same characteristics than those of the USA and other developed Western countries, it is likely that the same magnitude of health problems and expenditure are prevalent here and the rest of the Western World. Despite all the available knowledge on health, health conscious people:

- Increasingly finds themselves overwhelmed with contradictory advice. While they still digest the findings of a research study, they hear of one with the opposite message.[2]
- Are exposed to news about health risks that comes thick and fast, virtually every day, almost always seeming contradictory.[3]
- Are receiving advice about what to eat and basically how to live, but this advice seems to do an about-face every time a new study is published in a medical journal.[4]
- Are subjected to wrong claims about food supplements and weight-loss programmes that are made by many so-called nutritionists and other "experts".
- Receive information that is based on sound research on a particular nutrient related issue, but is presented out of context, in order to promote health products.[4]

It is therefore not surprising that ordinary people are confused and not able to make informed decisions about lifestyle habits. In addition, many people just ignore health warnings despite the fact that they are flooded by confirmed health risks such as smoking, alcohol abuse, and a sedentary lifestyle.

Apart from ignorance media-driven misunderstanding of the epidemiological research process and interpretation of data might be partially attributed to a lack of an understanding of this field. It is proposed that evolutionary, or Darwinian medicine, may provide a solid foundation for health promotion research and ultimately for public education and health promotion. Some of the reasons for this suggestion are the following:

- Our gene pool was shaped by natural selection for optimal functioning in past environments that are very different from the ones that we now live in.

  This is because the changes in the environment in which we live are very rapid due to, for example, industrialisation, pollution, food processing and availability of drugs, as opposed to the normal slow

genetic adaptations of our bodies over many decades. Therefore, our responses are not matching the stresses by the environment on the body.

- There have been some genetic changes since the commencement of new agricultural practices. However, natural selection is very slow and consequently most of our genome remains adapted for ancestral conditions.
- The resulting mismatch between our ancient bodies and the circumstances of modern life in affluent Western nations at present induce the development of chronic degenerative diseases.

The womb's shadow:

The in utero environment plays an important role in the normal development of the foetus. Changes in this environment due to poor nutrition, smoking, nicotine replacement therapy, alcohol intake by the mother, as well as drugs, may reprogramme the homeostatic mechanisms that control growth, development, ageing, and maintenance of the foetal organs. This may result in the onset of diseases later in life, as well as increased susceptibility to diseases. The old model of adult degenerative diseases was based on the interaction between the environment and genes. The new model addresses interaction between the in utero and external environment that influences the programming of the foetus and neonate, with the consequent late onset of diseases.

If the above is correct, it can serve as a plausible basis for health research promotion.[5]

Such research might uncover ways in which we can consume food in such a way that it is matching our body's metabolic demands appropriately. In other words, to consume *space age* food so that it matches our *stone age* metabolic suystems. It may also contribute to a better understanding how to choose food and how it should be prepared to ensure a healthy body. It can also generate knowledge to educate the general public of what to do to stay healthy in this modern age full of visual, smell and taste sensations that tempts us to ignore what is good for our health and the health of our progeny.

Evolutionary basis for health promotion

Since the beginning of the 19th century, life expectancy in industrialised countries has doubled. This can partly be attributed to improvements in medical care and sanitation, higher levels of education globally, as well as improved economic prosperity. The latter greatly contributes to carrying the cost of medical interventions. Higher levels of education result in better knowledge of the impact of lifestyle on the health of adults and children. As a consequence, better lifestyle choices can be made which will eventually contribute to improved health – not only for the parents, but also for their children and grandchildren.

Over time the nature of disease has changed as a consequence of changed lifestyles, especially in Western countries and in countries and communities that adopted a Western lifestyle. Where infectious diseases were a primary cause of mortality, it was overtaken by degenerative diseases, which is now endemic in Western societies. Although the lifespan of the individual plays a role in the development of diseases as the person ages, an evolutionary perspective suggests that the conditions in Western societies are not the inevitable consequences of longer lifespan. Rather*, it is a mismatch between "stone age" genes developed over a very long time and "space age" living conditions.* Human physiology is designed for *"stone age"* conditions. During the *"stone age"* food was unrefined and levels of physical activity were much higher than today. The changes in the ancient environment due to industrialisation and increased prosperity of large portions of the world population to the present day environment, was too quick for the human biology to adjust accordingly. The consequence is a mismatch between the *"stone age"* and *"space age"* genes and the concomitant disruption of original complex homeostatic mechanisms. Disruption of these homeostatic control mechanisms induce diseases in the longer term and might have adverse effects on the offspring if the mother's homeostatic mechanisms were interfered with during pregnancy and lactation.

The Palaeolithic *age, era or period is a prehistoric era distinguished by the development of the first stone tools. During this period humans grouped together in small societies and subsisted by gathering plants and hunting or scavenging wild animals.*

Evidence of the effect of "s*tone age"* genes and "s*pace age*" circumstances shows that hunter-gatherers and people who continue to practice critical aspects of Palaeolithic life all undergo age-related deterioration of the body. However, their overall health or disease pattern is different. The "*stone age*" hunter-gatherers and those still maintaining a similar life style rarely developed chronic degenerative diseases. On the other hand, the present day "*space age*" lifestyle is characterised by a marked increase in the incidence of diseases such as high blood pressure and increasing adiposity. It actually reached epidemic proportions in especially the developed countries of the Western world, including South Africa, where South Africa is a developing country. Increasing adiposity is also accompanied by a decrease in lean body mass. The decrease in lean body mass can largely be attributed to lower physical activity, as opposed to the active lifestyle of the hunter-gatherers. The lower physical activity can largely be attributed to the "space age" lifestyle adopted by recent generations. This promotes inactivity due to the use of, for example, the electronic media and equipment for relaxation, instead of physically participating in sport. Modern transport systems and elevators in multi story buildings are also making it ever so easy for people not to walk or to climb steps.

Other diseases of the "space age" era include hypercholesterolemia and insulin resistance. These diseases were rare amongst the hunter-gatherers of similar age. This implies that many chronic degenerative disorders are not necessarily linked to ageing, but are rather due to lifestyle choices and environmental circumstances which differ from that of our ancestors. Overwhelming evidence from epidemiological studies, as well as controlled laboratory studies, show that not only the external environment, but also the in utero environment impact on the future health of the unborn baby. Lifestyle choices do impact on the in utero environment and in this way the mother, without being aware of it, influences the health of the offspring in the longer term.

Lean body mass

Lean body mass is a component of body composition, calculated by subtracting body fat weight from total body weight. Total body weight is lean plus fat. In equations: The percentage of total body mass that is lean is usually not quoted: it would typically be 60–90%.

Source: http://en.wikipedia.org/wiki/Lean_body_mass

Since we are living in environments that are often polluted, or prefer a lifestyle in which we over-indulge in alcohol, drugs and food, the unborn baby is automatically exposed to many of the foreign materials that we are in contact with. It is in the air we breathe and the food and drink we consume. We must therefore be informed about it to be able to choose wisely for the unborn baby too. Our ancestors were not exposed to the same, often polluted, environments. They were also not exposed to environments where especially refined foods are in a constant oversupply. This means that their bodies and unborn babies were not challenged by factors, such as pollution and bad lifestyle choices. Until the present era, death was caused by sudden onset conditions, such as infections, malignancies, injuries and poisoning. Today these conditions can be cured by procedures and medicines developed over many years. These procedures and medicines are based on sound research procedures and refinement of processes over several years.

Today, conditions that slowly develop over many years as we age, or that were induced in the womb by bad lifestyle choices, cause more and more deaths. These diseases are often not curable and are often transferred to the next generations. The question we must ask ourselves is: do we want to maintain a lifestyle that will ultimately punish our children and grandchildren for our bad choices, often with the knowledge of the consequences of the lifestyle?

Knowledge of where we come from, in other words from the "*stone age",* to where we are today, in a *"space age"* environment, will assist us to make more informed choices regarding health in the short and longer term.[5] The "*space age*" technology can be used to obtain the relevant

information from, for example the internet, so that we can be better informed to make wise lifestyle choices to avoid the development of lifestyle associated degenerative diseases. In this way, it can play a role in preventing the transfer of these degenerative diseases from generation to generation, in other words, developing diseases that run in families.

It must in all fairness to the general public be said that mutch of the information available on the internet, magazines and television are misleading and actually of such a nature that it makes it impossible to make the righ lifestyle choices. This makes it crucially important that education strategies be developed to counter the wrong information in the media. The correct information must actually be as visible as those that are misleading.

The human evolutionary past and developmental plasticity

Evolutionary change is usually an extremely slow process. It can also be relatively "rapid", especially for traits affecting survival in early life. According to Darwin, animal populations have two adaptation strategies: a) *natural selection* based on genetic variation taking place over many generations, and b) *developmental plasticity* acting within the lifetime of an individual. The latter can be induced by lifestyle choices of the parents or grandparents. These choices might be parental smoking, use of drugs, or eating habits during the period before conception, as well as during pregnancy and lactation.

Most phenotypic changes in early life have an immediate adaptive advantage, such as altered regional blood flow to protect the foetal brain at the expense of the growth of other organs. On the other hand, many of the phenotypic effects that are seen are the result of developmental plasticity. Although these changes are induced during early phases of development, it may only become evident later in life. This implies that the newborn appears normal at birth but is "programmed" to develop diseases later in life. This may not always be the case but the capacity of the body to resist the stresses in the environment, such as oxidants, foreign materials, under-, over-, or malnutrition, pollution, and others, is compromised rendering

Phenotype:

1) The physical appearance or biochemical characteristic of an organism as a result of the interaction of its genotype and the environment.

2) The expression of a particular trait, for example, skin colour, height, behaviour, etc., according to the individual's genetic make-up and environment.

Genotype:

The genetic make-up of an individual.

Therefore, the phenotypic changes induced *in utero* or in the neonate may confer an advantage well after birth, by adapting the organism to have a greater chance of survival. Natural selection will favour such processes, even if it comes at a cost later in life. Such costs will become increasingly apparent with greater longevity in a population. This implies that poor lifestyle habits during pregnancy and after birth, when cell division is rapid and the cells of the foetus and neonate are most sensitive for environmental influences, may induce changes in the phenotype. This may present itself in diseases later in the life of the offspring.[7,8] So, what it means is that during rapid growth the genetic and epigenetic characteristics of the rapidly dividing cells are more vulnerable to the effects of the environment and therefore easier to be "programmed" than when cell division is slow.

How can gene mutations affect health and development?

To function correctly, all cells in the human body depend on thousands of proteins to function properly in the right places at the right times. This is a very tightly controlled process. It ensures a normal internal environment, where all cellular processes can function optimally to ensure normal development and health of the individual. Sometimes, gene mutations prevent one or more of these proteins from working properly. By changing a gene's instructions for making a protein, a mutation can cause the protein to malfunction or to be missing entirely. When a mutation alters a protein that plays a critical role in the body, it can disrupt normal

development, causing a disease. A disease caused by mutations in one or more genes is called a genetic disorder. It may affect metabolism and the related developmental processes of the individual. This is because a specific set of metabolic pathways allows organisms to grow and reproduce, maintain their structures, and respond appropriately to their environments. This means that inheriting severe metabolic defects that, for example, compromise energy production, or the metabolism of amino acids, cofactors, hormones, mediators, xenobiotics and lipids, may result in a vast spectrum of individuals that may develop conditions such as neurodegeneration, developmental abnormalities, and increased susceptibility to cancer or metabolic diseases.[9]

In some cases, gene mutations are so severe that they prevent an embryo from surviving until birth. These changes occur in genes that are essential for development, and often disrupt the development of an embryo in its earliest stages. Because these mutations have very serious effects, they are incompatible with life.

It is important to note that genes themselves do not cause disease. Genetic disorders are caused by mutations that make a gene function improperly. For example, when it is said that that someone has "the cystic fibrosis gene," they are usually referring to a mutated version of the CFTR gene, which causes the disease. All people, including those without cystic fibrosis, have a version of the CFTR gene. This also holds true for inborn errors of metabolism, such as glycogen storage disease.[10]

Although mutations are associated with abnormal metabolism and development, not all mutations have a negative effect on health. In fact, only a small percentage of mutations result in genetic disorders. As an example, some gene mutations will alter the base sequence of DNA, but will not change the functioning of the protein that is made by the gene. This implies that the protein still functions in *"the right places at the right times"* to ensure health and normal development.[10]

Nutrition during "stone age" and "space age" eras

For many years scientists have theorised that the *"stone age"* diet is more compatible with human physiology than what we eat today. This is because evolution is an extremely slow process and changes in our diet have outpaced changes in our genetic make-up. The period in question is from about 2.5 million to 12,000 years ago, when man was a hunter-gatherer.

Currently it is recommended that a daily intake of five portions of fruit and vegetables is sufficient. However, the *"stone age"* individual may have consumed up to 25 plant-based foods a day. This represents a great variety of different types of plants, nuts, fish, birds and small mammals. They were omnivores.

It appears that *"stone age"* people may have died younger than we do today, but that wouldn't typically have been diet related. More common causes of death are likely to have been from infection, during child-birth, in battle, or simply due to lack of shelter.

Empty calories *found in foods with little or no vitamins, minerals, fibre or other nutrients. Examples of foods with "empty calories" are soft drinks, punches, many pastries, alcohol and candy, processed carbohydrates or fats, simple sugars. These are foods often rich in energy, but low in micronutrients.*

On the other hand, today, in the *"space age"* era, diet related diseases are on the increase in the Western world. A consequence of this is that the incidence of diet related diseases in the offspring are also on the increase. This can be attributed to the type of food that we all are exposed to. When we compare the foods that are eaten today with those of the Palaeolithic era ("*stone age"*), there is very little overlap. We get most of our energy (Kj or Calories) from grains that are mostly in very refined form, domesticated livestock, dairy products, and refined sugars. Today diets, certain fruit juices and food are often supplemented with vitamins and minerals. In addition to that we are also exposed to non-nutritional components, such as pesticides of agricultural origin, growth promoters and other products that are used to ensure a better crop or to protect crops. In the Palaeolithic era, humans ate naturally occurring plant foods and wild game, where the fat content of game usually was, and still is, very low compared to meat from sheep and cattle. They consumed almost no cereal grains and had no dairy foods, and no separated oils. No processed foods, no sources of "*empty calories*", no supplements and no pesticides or products to increase the crop volumes were available.

It is a common fact that, by including whole grains in your diet, you can get all the important micronutrients like minerals, vitamins, amino acids or fibre. This is not the case if we consume refined food, such as white flour. The latter supply a good amount of energy, but not all the nutrients that our bodies require for protection and homeostasis.

*Definitions of a **calorie,** as a unit of expressing energy content of food, fall into two classes:*

*The **small calorie** or gram calorie (symbol: cal) approximates the energy needed to increase the temperature of 1 gram of water by 1 °C. This is about 4.2 joules.*

*The **large calorie,** or kilogram calorie, dietary calorie or food calorie (symbol: Cal) approximates the energy needed to increase the temperature of 1 kilogram of water by 1 °C. This is exactly 1 000 small calories or about 4.2 kilojoules.*

***Homeostatic control** keeps factors such as temperature and blood pressure in the body nearly constant, despite changes in an organism's activity level or surroundings. Such systems operate by detecting changes in the variable that the system designed to hold constant and initiating some action that offsets any change. A sensor within the body responds when the actual condition in the body differs from the desired one, a device to ensure that any action taken will reduce the difference between actual and desired, and an effector to take the needed action as directed. The crucial aspect is that information is fed back from effector to sensor and action is taken to reduce any imbalance – hence the term negative feedback.*

Naturally occurring plant foods contain all the fibre and micronutrients in the ratios that are necessary to support normal growth, development, and

maintenance of the body. The intricate *homeostatic mechanisms* in the body are designed to ensure health under conditions where a Palaeolithic diet is prevailing. This includes maintaining the energy balance in the body. Using over the counter supplements may in fact be deleterious to your health because it often distorts the normal nutrient ratios in the body.

The "*stone age*" people consumed more animal protein than Westerners are currently doing. The proportion of fat ingested varied, but the intake of food that increase serum cholesterol was almost always far less than at present.

During the Palaeolithic era, carbohydrate consumption varied, but in all instances the carbohydrate came mainly from fruits and vegetables and not from cereals, refined sugars, dairy products and soft drinks. The *"stone age"* diet contains less sodium, but more potassium and fibre. It also contains more micronutrients and phytochemicals that are working together to ensure protection and health of the individual.[5] The "stone age" diet contains all the nutrients to ensure a healthy gut micro-organism population that is essential for health of the individual.

What does it mean if a disorder seems to run in my family?

A particular disorder might be described as "*running in a family*" when more than one person in the family has the particular disorder. Some disorders that affect multiple family members are caused by gene mutations. These mutations can be passed down from parent to child. In other words, the child inherited the disorder from the parent. Such disorders can "*run in families"* for many generations.

Other conditions that appear to "*run in families"* are not caused by mutations in single genes. Instead, environmental factors, such as dietary habits or a combination of genetic and environmental factors are responsible. Parental lifestyle often plays a major role in creating conditions that may induce genetic or epigenetic changes. These may present themselves in the form of a disorder that may be passed from one generation to the next.

It is not always easy to determine whether a condition in a family is inherited. A genetics professional can use a person's family history to obtain health information about the immediate and extended family to help determine whether a disorder has a genetic component or not. Information

about the health of people from several generations of the family, usually first-, second-, and third-generation relatives are obtained for analysis. Information obtained in this way is often a clear indication of the origin of the condition and who is likely to inherit it. Studies showed that the transmission of a risk of metabolic diseases from one generation to the next often occurs. One such disease is diabetes mellitus. It is also evident that exposure to dietary lipids and other dietary factors at critical phases of foetal and postnatal development indeed play a role in determining adult disease risk. It has also been shown that persistent maternal obesity causes a generation-to-generation amplification of body fat weight. In animal and human studies it was shown that diets supplemented with methyl donors, such as folate, that is used as a prenatal supplement to prevent the foetus from developing facial clefting as well as neural tube and cardiac defects, can enhance the severity of allergic airway disease in the offspring. This predisposition appears to be partially transmitted to subsequent generations. It is interesting to note that dietary folate from foods and vegetables, not supplements, is not associated with asthma in either age group at any stage of pregnancy. This clearly shows that we must avoid the use of supplements especially during pregnancy and lactation, unless a deficiency for a specific nutrient has been diagnosed. Excess as well as nutrient imbalances induced by supplementation may contribute to "programming" of the foetus during phases of development during which plasticity is very high. This will make the offspring more prone to foetal onset of adult diseases.

The above clearly show that the dietary habits of the parents during pregnancy and during early development of the child may result in "programming" of diseases to appear later in the life of the child. This implies that the nine short months of life in the womb may shape the baby's health for as long as he or she lives. It is however, not only dietary habits but also other lifestyle habits, such as smoking, alcohol abuse, drugs, to name a few, that can adversely impact on the baby's health and development. This may even create a change in the metabolism and function of the baby that may reduce his or her resistance against disease, which might be transferred to the next generation or generations. It may also reduce the lifespan of the offspring.[11]

What is foetal onset of adult disease?

As the term implies, adult onset diseases are those diseases that tend to appear after childhood and adolescence because its onset later in life is

already determined during the foetal stage of development. For example, the major causes of death and disability for Americans are heart disease, stroke, cancer, and diabetes, and all tend to take their toll during middle-age and the senior years. Advances in the understanding of these diseases now make it possible to take the relevant steps to help prevent or minimise the damage associated with them. The sooner those steps are taken, the more effective it will be.

The foetal origins theory is of enormous relevance to the developing world. The implications for global health and productivity cannot be ignored. This means that, if health authorities want to reduce chronic diseases globally, they should understand how the human foetus is nourished and how malnutrition changes its physiology and metabolism. Interventions can then be developed and implemented to limit the damage.[12,13] This is also true for other lifestyle habits that changes the environment in which the foetus and newly born infant develops. The mother is actually the environment for the foetus and newborn and her lifestyle decisions directly affect the future of her offspring. It is however, very important that not only the mother, but also the father, takes responsibility for adopting a lifestyle that will not only benefit their own health, but also that of their children and subsequent generations.

The challenge is to develop programmes that will simultaneously combat apparently opposite nutrition problems: malnutrition and "over-nutrition". If we consider females as “the environment” that affects the growth and development of the foetus and newborn, improving the nutrition of women is even more imperative, especially when considering that it may contribute to preventing chronic diseases in the next generation, in addition to enhancing health and survival of mothers and children.[14] It is also obvious that the father must ensure that the mother is not exposed to, for example, tobacco smoke because tobacco smoke will change her body composition and thus the environment within which the child must develop.

The promise of adult onset genetic disease

Everyone is at some risk for the most common adult onset diseases, but some of us have a genetic predisposition that puts us at a significantly greater risk. Knowing that a genetic alteration predisposes a person for developing blood clots or breast cancer, for example, allows that person and his or her physician to map out an individually tailored prevention or

treatment plan, even before the disease is clinically noticeable. In other circumstances, genetic testing may be the answer to identifying the cause of an otherwise unexplainable medical event, such as having an adverse reaction to medication. The key is using the information gained through genetic testing to take proactive steps to minimise harm and to make informed decisions about how that inheritable disease may affect future generations.

Although genetic testing might offer evidence of, for example the susceptibility of the child to develop heart disease later in life, a whole host of ethical issues must first be addressed. However, in the future, it may be feasible to prevent adult onset of diseases by identifying and modifying environmental risk factors among genetically susceptible persons. Genetic testing might allow for the identification of persons truly at increased risk for an illness and for targeted medical interventions.[15,16]

We are living in a period where we can use "*space age*" technology to assess the likelihood of an individual to develop certain diseases based on lifestyle choices made by the parents and even grandparents. However, we must remember that our bodies are still very much "*stone age*" in their ability to control, for example, metabolism of nutrients, or to respond to the environment. It is therefore to our advantage, and consequently that of our descendants, that we live a lifestyle that is compatible with the "*stone age*" design of our bodies. This will reduce the incidence of degenerative diseases, as well as those diseases that are induced by a certain lifestyle and which are transferred from the grandparents to subsequent generations. By adopting a lifestyle that will enable your body to be optimally efficient in controlling metabolism and protecting itself, we may even be able to turn certain inherited degenerative diseases around.

CHAPTER TWO

LIFESTYLE AND HEALTH TODAY

"Even gene expression 'submits to lifestyle', and is therefore the causative factor in the 'foetal onset of adult diseases."

Introduction

Parents should make lifestyle changes even before conception of their baby, but especially during pregnancy and early childhood to secure a health promoting environment in which the foetus and newborn child can develop. Parents are usually very receptive for advice to promote a lifestyle that will enhance the health and development of the foetus and newborn. This implies that pregnancy and early parenthood are the ideal opportunities for promoting a healthy lifestyle.

The question that we need to address first is: What is lifestyle? The term "lifestyle" was originally coined by the Austrian psychologist Alfred Adler in 1929. The current broader definition of the word which now also includes the way in which people live based on the level of income and availability of resources, dates only from as recently as 1961. Lifestyle is therefore defined as the way in which people lives. A lifestyle is a characteristic bundle of behaviours that make sense to both others and oneself in a given time and place. This bundle includes social relations, consumption (food, alcohol, and drugs), entertainment and dress. The behaviours of particular lifestyles are a mixture of habits, conventional ways of doing things and reasoned actions. It reflects a person's attitude, values and worldview which is often also a reflection of the level of education or the environment within which he or she functions. Lifestyle is therefore a means whereby an individual create symbols that reflects his/her personal identity. However, many factors in the environment is not controllable and consequently, not all aspects of lifestyle are voluntary. Surrounding social and technical systems can constrain the lifestyle options available to the individual. The gap between personal identity and the everyday activities of the individual that represents a particular