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NUTRIGENOMICS: THE SCIENCE OF INDIVIDUALISED NUTRITION

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ABSTRACT

The purpose of this study is to understand the concept of how food affects a person's genes and how a person's genes affect the way a body responds to food. It stands for the effects of foods on gene expressions .

A combination of Nutrition & Genomics , apparently talk about individual food demands alongside the another interdisciplinary field of biology focusing mostly on the structure , mapping , functions or editions of genes.

KEYWORDS: *Genomics, Nutrition, Diabetes, Alzheimer's Disease, Genotype, Metabolism, DNA, Chromosomes.*

INTRODUCTION

It is a dream of every person to live long without the diseases. but it is almost impossible. Lifestyle diseases like "Alzheime' s Disease, Type -2 Diabetes , Arthritis or heart diseases have become very common. The risk of developing such diseases may involve things like – life schedule , how does one work , what is the food habit , physical activity , sleeping pattern , any stress factors , kind of foods one eat . Although sometimes few of us got these problems by birth which in medical term known as "CONGENITAL DISEASE ".

A human cell contains 46 chromosomes of which 23 come from father and rest 23 from the mother. Each chromosomes consists of a long molecule of DNA and segments of DNA represents genes of a person. These genes constitute the genotype or genetic makeup of an individual. a gene contains the genetic information needed to develop and direct the activities of every organisms including humans. And this information is known as genetic code of an organism, is stored in strands of DNA molecules , contained as linear sequences consisting of our nitrogenous baser adenine , guanine , cytosine and thymine . Eachof these nitrogen base represented by the letters A , G, C & t. and are arranged in sequences of three letter codes , referred to as codons . a human cell with a single set of chromosome contains a total of just over three billion DNA base pairs , which carry instructions for making protein .

In 1990 (HGP) The Human Genome Project was started to map the 3 billion base pairs of the human genome. This was expected to aid different genetic diseases and 90% cases of genetic or DNA diseases were identified. According to HGP , about 0.2% differences or 500 bases may differ in case of DNA.

Existing method of analyzing DNA of individuals involve the use of PCR. It actually amplifies or makes multiple copies of small amounts of DNA – much like a Xerox machine produces multiple copies . there is an another technique , namely "Barcode Technique "which does not require amplification . it obtains a signature of the DNA molecule by simply melting it therefore every genetically response of a person or

every biological response response to nutrients is ultimately guided by the genes possessed by individual through protein expression .

HUMANS DIETARY NEEDS

Every individual has to consume food for health and growth & It must produce enough calories to meet daily needs of a human. And it must include – protein, fat , carbohydrate , minerals and vitamins. And each of them a proportionate amount. it is difficult to be specific about everyone's dietary needs as this may vary as per age, sex , occupation , body size or activity level . as per the researchers from Norway , there has to be 40% carbs in each meal otherwise it can stimulate our genes to inappropriately activate the immune system , which interrupts many other body systems .

The diet affects the genes that are associated with development of cardiovascular diseases,cancers, dementia or Type 2 diabetes. The answer is not easy.

METABOLISM

In our body the food we eat is converted into energy through a complex series of chemical process known as metabolism. Metabolism employs various enzymes to break down complex substances into simpler ones and to build them back into different complex substances, release energy , eliminate wastes and thus enable the organism's growth and continued functioning .. An example of catabolism is the digestion of protein which is broken down into amino acids that a person's body can absorb and use through the metabolic process , storing glycogen in liver for energy . The metabolic rate for each person in different and depends on several factors , some we can control and some we can't . Age,gender, body fat and genes all work together to determine out metabolism . ultimately, our metabolism is responsible fr how quickly or easily we gain or lose weight .

After reaching the age 40 , metabolism slows down at a rate of 5% per decade due to growth hormone production . Men have higher metabolism than the women since men tend to have more lean muscle than women. though heredity plays an important role . some people are born with naturally higher or lower metabolic rate and this is due to the genes of parents . thus an individual's gene has an affect on the metabolism also and how body reacts to nutrients .

GENETIC DISORDER OF METABOLISM

Inter individual differences in genotype, which have an effect on metabolism and on phenotypes were recognized early in nutrition research . with the progress in genetics , biochemical disorders with a high nutritional relevance were linked to a genetic origin . some genetic disorders of metabolism include fructose intolerance which is the inability to convert the carbohydrate into glucose and galactose . many individuals have either gluten intolerance or lactose intolerance or both due to their genetic make-up. They have to opt for gluten free diet and also avoid milk and milk products to avoid further problems . some other disorders may include the polymorphism in the gene for the hormone leptin which results in gross obesity. Leptin is a hormone made up of adipose cells that helps to regulate energy balance by inhibiting hunger . such genetic disorders of metabolism can be controlled or some extent by manipulating the diet

NutriGenomics – The Study Of Effects Of Nutrition On GeneExpression

Through out the 20th century nutritional science focused on the importance of vitamins and minerals , defining their use and preventing any sort of diseases that happened due to deficiency . as the nutrition related health problem of the people shifted to over-nutrition , obesity , diabetes , diet related disease etc . in the 21st century the focused changed accordingly . the roles of diet are being extensively studied to address the increasing incidence of diet related diseases.

Scientists in nutrition research are studying about how nutrition can optimize and maintain cellular , tissue or organs or the whole body homeostasis . this requires studying how nutrition acts at the molecular level involving a magnitude of nutrient related interactions at the gene , protein and metabolic levels. As a

result , nutrigenomics was born to examine how nutrients affect the thousands of genes present in the human genome.

It is a new field of study that is aimed at the relationship between nutrition and genes . sometimes called nutrition genomics , investigates how the foods we eat interact with our genes to affect our health. This depends upon the genotype . the body may respond in different ways to different nutrients . i.e . different types of genes that respond differently to fats , so a person having genotype " A "may be able to tolerate a slightly higher level of saturated fat without it having a negative impact on his LDL cholesterol. On the other hand person having genotype "B" may need a much lower level of saturated fat in his diet because if he eats above that amount , it significantly increases his LDL cholesterol. It has been reported that the effect of ply-unsaturated fatty acid (PUFA) intake on HDLC concentrations is modulated by a variation of the APOAI gene . such knowledge may help reduce cardiovascular risk . this shows the impact of one's genotype on the metabolism of the food taken , or individual differences in response to dietary intake .

There is genetic difference between the humans which explains why some people respond differently than others to the same nutrients . it has also been known for a long time that individuals respond differently to certain drugs and supplements. A study published in a journal of the American Medical Association demonstrated that in some individuals , coffee intake lowered the risk of heart attacks because they have the fast version of gene CYP1A2 which breaks down caffeine very rapidly while reserving the healthy antioxidants in the coffee . these antioxidants offer protection for the heart . but in some individuals the same dose of caffeinated coffee increased the risk of heart attacks because they have a limited capacity to break the caffeine because of having the slower version of genotype . some other studies showed the ability of fish oil to reduce blood lipids , effects of saturated fat reduction on plasma cholesterol levels and how certain phytochemicals can be biologically active in some individuals . a few studies have shown that people who have a particular allele of the PPARg gene respond favorably to the blood lipid lowering effects of fish oil. Many studies have shown that a diet can modify the expression of a gene .

For example , an international research team has found that , a diet of fruits and raw vegetables appear to negate the effects of the gene 9p21 on human chromosome 9 that has ben shown to increase the risk of heart attacks .thus it observed that nutrition becomes indeed one of the environmental factors influencing gene expression . these researches have enabled us to understand why some individuals respond differently than others to the same nutrients .

CONCLUSION

It is a rapidly emerging science , still in its infancy . it tries to probe the relationship between genes and diet . it has it's ultimate goal being to optimize health through the personalization of diet . the scientist argue that diet is the key to controlling a person's genetic susceptibility to disease. A particular nutrient may bring about alteration in gene expression manifesting a chronic disease , while introduction of some other nutrient may reserve process . there is a lot of potential in developing ways of eating and developing particular diet plans that can help treat or possibly prevent a myriad of healthconditions, thus improving quality of life band achieving health conditions thus improving quality of life and achieving healthy aging . another emergingfield is personalized medicine which uses sophisticated DNA tests to ascertain the drugs most suitable for a patient . in is hoped that by building up knowledge in this area , this area of study will increase understanding of how nutrition influences our body or genes in different ways

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