Chapter 3
Nutrigenomics and Nutrigenetics and the Medicinal Values of Vegetables and Fruits

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ABSTRACT

Since the accomplishment of the human genome sequencing project by March 25, 2003, nutritionists, biochemists, and modern genome epidemiologists became involved in genome-based nutritional research studies. In fact, the completion of a high-quality, comprehensive sequencing of the human genome derived from the discovery of the double-helical structure of the DNA became a landmark event that has influenced several realms of academic research disciplines and their applications to maximize public health and minimize harm to health care consumers.

INTRODUCTION

The phenomenological approach has been adopted to investigate the concept of nutrigenomics and nutrigenetics regarding the medicinal values of fruits and vegetables in terms of worldwide application of basic foods to promote human health and minimize the onset of the incipient stages of diseases. Innovatively, within the realm of public health genomics, the influence of nutrients on human gene expression is characterized as nutrigenomics. While the heterogeneous response of gene variants to nutrients, dietary components and developing nutraceuticals is called nutrigenetics. At a global scale, genetic variations have been observed to affect food preferences and tolerance among human groups from several regions of the world. These ecological, environment and other haplotype characteristics influence dietary requirements, preferences, and metabolic tolerance between the onset of diseases in human groups and individuals. Essentially, nutrigenetics characterizes the genetic profile, which has an impact on how the human body reacts to bioactive food components be modifying or influencing absorption, metabolism and site of action (Farhud et al., 2010). Specific illustrations of known phytochemical nutritional applications have been illustrated regarding their efficacy and control of hypertension and high blood pressure,

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which is one of the leading pandemic disease and the precursor for the incipient onset of cardiovascular
disease, stroke, type 2 diabetes, and other nephritic syndromes. The relevance of nutritional epidemiologic
techniques in the elimination of vitamin-deficiency diseases was outlined. Besides, the quantitative
techniques for detecting and diagnosing these diseases were meticulously illustrated and the relevance
of prompt referral of at-risk patients to physicians and other clinicians was resounded.

A monumental scientific feat of the twenty first century has been the accomplishment of the Human
Genome Sequencing Project (HGSP) by March 25, 2003 which led to numerous scientific breakthroughs.
Evidently, those economically sufficient industrialized nations in a breathtaking manner rapidly devel-
oped numerous genome sequencing technologies. The human genome sequencing project, which began
in 1990, involved highly committed scientists from several parts of the world and led to the generation
of a high-quality reference sequence for three billion base pairs of nucleotide sequences, which make up
the human genome. From this scientific project, geneticists, molecular biologists, and modern genome
epidemiologists revealed the DNA sequence present in a genome contains the complete code, which
determines specific genes and proteins that are present in human cells. The scientific feat achieved
from the HGSP has led to the advancement of science and the requisite technologies to improve clinical
therapeutic interventions to enhance human health and cure hitherto chronic and degenerative diseases.
Human genome sequencing has increased and enhanced the emergence of commercial genomics, as well
as the analysis of the rise of the biotechnology subsector in this era of genomic science.

In spite of the innovations derived from genomics, biochemists and modern genome epidemiologists
have specific functions to play in creating awareness about the global ecological phenomenon and the
cultivation of fruits and vegetables which, for several years, have been utilized for their medicinal prop-
erties. Advances in genomics and the biochemical analysis of these foods have revealed their naturally
phytochemical nutrients, which have specific therapeutic impacts against high blood pressure, stroke,
certain forms of cancers, scurvy, several topical infections, gastroenteritis, atrial fibrillations, and as-
sociated chronic and degenerative diseases.

Many fruits and vegetables have the ability to interact with and modulate specific molecular mecha-
nisms which guide an organism’s physiological functions. In the age of genomic science, it is this
awareness of the incipient stage of nutritional scientific breakthrough that has spurred a revolution in
the field of nutrition.

Nutritionists and biochemists have crucial roles to play in public health genomics because large-scale
population-based epidemiological studies involving nutritional interventions may use imprecise but
comprehensive data without insights from genetic knowledge. In addition, erroneous scientific conclu-
sions and misinformed nutritional recommendations could be made in very dire clinical settings (Wahli
& Williamson, 2005).

Quite emphatically, to avoid such clinical issues and conscientiously research the relationships
between genes and diet, the field of nutrition has been to capitalize on harnessing innovative genomic
technologies, bioinformatics, and supporting analytical software and other sophisticated statistical tools to
conduct meaningful nutritional studies which have the potential to unravel hitherto unknown scientific
facts about fruits and vegetables that we consume for healthy living.

Naturally we consume these fruits and vegetables to maximize human healthy living and to eliminate
potential protein energy malnutrition.
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