



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2019; 8(6): 386-390
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www.thepharmajournal.com
Received: 19-04-2019
Accepted: 21-05-2019

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Development of premixes for preparation of nutrigenomic food and its impact on life style related diseases

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Abstract

'Nutrigenomics' is one of the lively scientific advancement influencing mankind around the world. Food or more precisely 'nutrition' has the major impact in defining the cause response interaction between nutrient (diet) and human health. In addition to substantial understanding of nutrition human health interaction, bases of 'nutrigenomic' development foster on advent in transcriptomics, genomics, proteomics and metabolomics as well as insight into food as health supplement. Interaction of selected nutrient with associated genes in specific organ or tissue necessary to comprehend that how individual's genetic makeup (DNA transcribed into mRNA and then to proteins) respond to particular nutrient. It provided new opportunities to incorporate natural bioactive compounds into food for specific group of people with similar genotype. It covers the general overview of nutrigenomics, and the role of SNP in gene alteration, diet supplementation and public awareness. It is understood that with the increasing changes in the food habits and life styles, people are becoming more prone to diet related disorders. Therefore there is an urgent need to boost more research in this field to help people in understanding the relationship between diet and health with the development of product, and to ensure that everyone benefits from the genomic product revolution, various aspects of R&D in nutrigenomics are reviewed to ascertain its impact on human health, especially with lifestyle related diseases.

Keywords: Nutrigenomics, nutrient, proteomics, genomics, food habits

Introduction

The concept that diet impacts wellbeing is an ancient one. Nutrigenomics incorporates known connections among sustenance and acquired qualities, called 'inborn errors of metabolism', that have for some time been treated by controlling the eating regimen. For instance is Phenylketonuria (PKU), it is brought about by a change (transformation) in a solitary gene (Clarke JT, 2003) [3]. Influenced people must stay away from nourishment containing the amino acid phenylalanine. The Human Genome Project of the 1990s, which sequenced the whole DNA in the human genome, kicked off the art of nutrigenomics (Collins, 2003). By 2007 (Castle & David) researchers were finding various interrelationships between genes, sustenance, and ailment. Nutrigenomics brings along new phrasing, novel exploratory systems and an in a general sense new way to deal with nourishment inquire about, for example, high throughput advancements that empowers the worldwide investigation of quality articulation in a phone or living being. Nutrigenomics would require a community exertion from individuals in hereditary qualities and the businesses of general wellbeing, sustenance science and culinary. It's anything but difficult to make great tasting food with certain fixings. Put some oil or margarine in it, and it will taste great. The test is the manner by which to take the fat out and make fortifying yet additionally great tasting nourishment." Therefore a move in general wellbeing is incredibly required, and with an expanding occurrence of weight and unending sicknesses, for example, type2 diabetes, nutrigenomics may end up being the panacea later on. Wellbeing is an image of value life and success of any progress, which definitely connected with financial status and living condition of neighborhood occupants crosswise over main lands. World Health Organization in its constitution characterize '*as a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity and fundamental rights of every human being without distinction of race, religion, political belief, socioeconomic condition*'. Wellbeing implies the human's practical or metabolic capacity of self-acclimatization under antagonistic conditions. The investigations recommended a stamped increment in noncommunicable sicknesses particularly in quick advancing nations. Inherited character, hereditary cosmetics and accessibility of nutritious sustenance is not just factors

representative to wellbeing status, however it is significantly more perplexing association between person's genome (whole arrangement of qualities present) and ecological elements looked over lifetime. Moreover, nourishing dimension, centralization of bioactive and their capacity to impact wellbeing status are a portion of the critical elements, which should be tended to in studies pointing sustenance supplement wellbeing communication. In this way, the science engaged with advancement of dietary enhancement, nutraceuticals or utilitarian sustenance, particularly for sickness aversion is profoundly perplexing. Change in working of specific qualities or their protein items amid movement of a specific illness is really affected by consequent adjustment in nourishing structure of sustenance or diet. The wonder of association between supplements qualities infections is a profoundly mind boggling. Be that as it may, the logical interest beginning from detachment of DNA (1869), explanation of its structure (1953) lastly disclosure of human genome (2003) help to determine numerous such complexities. The acknowledgment of these logical leaps forward was just conceivable because of parallel mechanical progressions, particularly in the territory of 'Omics' (transcriptomics, epigenomics, proteomics and metabolomics) and 'Bioinformatics' (Figure 1). It unites the exploration of nourishment, genomics, computational science and bioinformatics, and sub-atomic drug to handle these constant ailments. The nutritionist comprehends capability of nourishment stronghold or supplementation of eating routine with specific supplement and its atomic impact in human wellbeing and decreases the danger of way of life related ailment. It likewise renders to help being developed of planned nourishment for people with specific hereditary foundations.

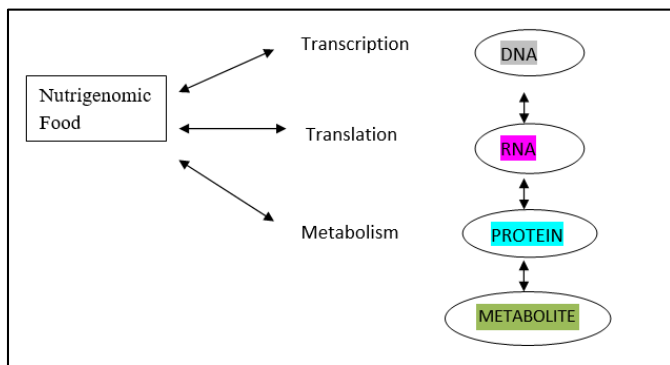


Fig 1: Nutrigenomic food components can modify DNA transcription, translation, and metabolism

Life style related diseases

Undesirable living practices are the main consideration related with present way of life. It is coming full circle into high mortality rate infections, particularly noncommunicable chronic diseases (NCDs) that are in charge of the majority of the deaths in past decade. Way of life related ailments are a gathering of ailments come about because of introduction of mankind over longer period to undesirable eating practices, way of life and living condition. These diseases share practically comparable hazard factors, attributable to, moderate in movement, non-infectious and non transmissible for example cardiovascular, sustenance actuated malignant growths, diabetes, perpetual bronchitis, renal failure, hypertension and so on (Fatma A.S., 2010) [7]. Essential thought process in determination of way of life related

diseases in present survey is completely founded on their effect in human wellbeing. WHO report recommended a fast change in sickness profile for recent decades from transmittable diseases to noncommunicable disease regardless of district, ethnicity and economy. Around 60 % deaths overall came about because of way of life related chronic diseases, double than irresistible sicknesses (WHO, 2009). In India as well, the noncommunicable diseases were in charge of 53 % deaths, out of which 24 % causalities alone contributed via cardiovascular diseases (CVDs). Generally, these diseases have explicit metabolic hazard factors related cell component that outcomes basically in mitochondrial modifications, oxidative pressure and irritation and so forth like epidemiological qualities. These reactions to changed condition contribute altogether in the beginning and movement of way of life related diseases. Fundamentally, it is the undesirable eating regimen that prompted increment in metabolic hazard elements of bloods like pressure, glucose, lipids and so on. Disease related with current way of life likewise modifies human body aggravation process. It is a self constraining and controlled procedure executed by inborn immune system (IIS), required to confine attack of foreign material and farthest point further harm to the human body. Inflammation process is constrained by eicosanoids, a metabolite from unsaturated fats (arachidonic, eicosapentaenoic and docosahexaenoic corrosive). Irritation answered to be adversely impacted by undesirable eating regimen and social ecological pressure looked by mankind in present. Diets having high immersed unsaturated fats and antinutrients (lectines, saponins), low dietary fiber and nutrients (D and K), and imbalanced cancer prevention agents thought about in charge of poor IIS movement (Cordain *et al.*2005) [4]. Logical examinations uncovered the qualities (plasminogen activator inhibitor1 related with weight) in creature display responsible for such change (Mutsuzawa *et al.*2001) [14]. The way of life and ecological changes not just affecting the human physiology and metabolic procedures, yet in addition modifying intestinal small scale biome prompting such wellbeing complexities (West C.E. 2015) [24]. A prior idea that connects these sicknesses with created countries was broken, as social, affordable, and natural elements are increasingly good for their spread in low and center pay nations (Nugent *et al.*2008) [16]. On the off chance that such change continual, it will additionally raise the disease profiles, particularly in developing and under developing countries.

Methodology

The present study "Product development on Nutrigenomic food and its impact on life style related diseases" was conducted in Lucknow are as follows. Lucknow district was purposively selected for the present study (Because one of the major city, capital and university located in Uttar Pradesh). In this University running school of home sciences under the course of food and nutrition, all works was done in the food and analysis lab.

Raw material used

Green pea, carrot, soya chunks and cabbage are used for the preparation of nutrigenomic badi. Raw material was purchased from the local market then pill off the material and removed hazard particle in it. It was dried by sun and dehydrated both methods, the time was taken nearly a week into dry form of the raw material. Dried raw material was grinded separately and collects in air tight jar.

Product preparation

For the preparation of 1kg nutrigenomics badi, these materials was used in different amount green pea powder (300gm), soya chunks powder (400gm), carrot powder (200gm), cabbage powder (100gm). All material weight in different ratio then mixes all the ingredients in plate. For the making of nutrigenomic badi mixes are cooked in hot water on gas burner nearly 10-15 minutes. Then all material mixes well cooked then salt, ginger powder, black pepper powder added for the taste change of the badi. After the making of nutrigenomic badi it was kept in dehydrator for drying, the time was taken 2 days. Nutrigenomic badi packed in air tight container and stored in dry and cool places.

Nutritional assessment of prepared product

Vitamin-A

Vitamin-A estimated by spectroscopic technique. The absorption at 460 nm and the difference in absorption at 328 nm before and after irradiation with UV light; using the alcoholic reagent KOH, by procedure extraction and saponification.

Protein

The Kjeldahl's method is utilized to estimate the measure of nitrogen present in an obscure sample. Traditionally, this technique is utilized to measure the protein substance of the food and measure of nitrogen. Nourishment is processed with a strong acid so it discharges nitrogen which can be controlled by an appropriate titration procedure. The measure of protein present is then determined from the nitrogen centralization of the nourishment.

Fat

Fat is estimated as crude ether extract of the dry material. The dry sample (5-10g) is weight accurately into a thimble and plugged with cotton. The thimble is then placed in a Soxhlet apparatus and extract with anhydrous ether about 16 hours. The ether extract is filtered into a weighed conical flask. The flask containing the ether extract is washed 4-5times with small quantities of ether and the washings are transferred. The ether is then removed by evaporation and the flask with the residue dried in an oven at 80-100°C cooled in a desiccators and weight.

$$\text{Fat content (g/100g sample)} = \frac{\text{Wt. of ether extract} \times 100}{\text{Wt of the sample (equivalent to fresh sample taken)}}$$

Carbohydrate (CHO)

The total saccharides moiety in an example can be assessed by the anthrone strategy which is a simple calorimetric technique with relative lack of care to impedances from the other cell mixes. The initial phase in all out starch estimation is to hydrolyze the polysaccharides and to hydrate the monomers (assimilation with sulfuric acid expansion and heat treatment). The 5-carbon (pentose) and 6-carbon (hexose) sugars are changed over to furfural and hydroxyl methyl furfural, individually. Whenever anthrone (a fragrant compound), it responds with these absorption items to give hued compound. The measure of absolute starches in the example is then evaluated by means of perusing the absorbance of the subsequent arrangement against a glucose standard curve.

Folic acid

Techniques for the assurance of folate by best fluid chromatography progressively accessible and permit separation between folate forms, yet these still experience the ill effects of poor affectability, variable reaction to a mixture of folates, interconversion of folate frames amid extraction and obstruction from other nourishment frameworks. While partition of the polyglutamate folate forms by HPLC is conceivable, the subsequent chromatograms are unpredictable and hard to decipher and deconjugation is normally completed to rearrange the assurance.

Zinc

Estimation of trace mineral zinc was investigated by atomic absorption spectrophotometer (AAS). In AAS, a light radiation from a particular wave length from a hallow cathode light (HCL-cathode made of explicit metal to be examined) goes through the fire to the detector. The fiery remains arrangement is suctioned into the fire. The sample is in the ground state, ingest vitality from the honor cathode light radiation and go to the energized state. The measure of radiation vitality consumed by the component is extent to its centralization of metal under examine. Instrument parameters, for example, resonant wavelength, cut width and air-acetylene stream rate that are fitting for every component were chosen (AOAC, 2000). The instrument was set up and adjusted according to the rules in the manual given by the producer. A calibration curve (concentration versus absorbance) for every mineral to be resolved was readied utilizing a scope of working norms. The fire parameters were advanced as per the instrument maker's directions. The standard arrangements were perused when each gathering of the 6-12 tests. The burner was flushed with water among tests and zero was restored each time. Appropriate dilution of the solution arrangements were made to peruse the substance of the minerals in the fiery debris arrangement.

Table 1: Nutrients of the product

Nutritional Content (per100gms)	
Protein(g)	16.25
Carbohydrate(g)	20
Fat(g)	5
Carotene(µg)	599
Folic acid(µg)	34.5
Zinc(mg)	1.06
Energy(kcal)	180

Result and discussion

All nutrients value presented in table no.1 and result and discussion are as follows-

Vitamin-A

Nutrients are micronutrients required in little amount and are including in the gene expression. The measure of Vitamin-A present as carotene in this item is (599µg/100g). PEPCK is vitamin A reliant protein associated with transformation of oxaloacetate to phospho enol pyruvate, one of the vital strides in gluconeogenesis Phosphoenol pyruvate carboxykinase (PEPCK) gene expression is diminished in vitamin A-deficiency (VAD) mice. Vitamin A inadequacy condition prompts changes in chromosomal structure of RARE (Retinoic Acid Responsive Element), which further prompts change in co controller authoritative and action. The decrease in RNA Pol (polymorphism) II affiliation is characteristic of

interference in the immediate associations of RNA Pol II with the PEPCK promoter, with general interpretation factors as well as with co controller particles that add to the enactment of the PEPCK quality. These outcomes increment comprehension of the sub-atomic reason for diminished PEPCK gene expression in VAD mice *in vivo* and offer extra knowledge into the guideline of other retinoid responsive qualities (Kelly *et al.*, 2003) ^[12].

Zinc

Zinc (1.06µg/100g) is a essential trace element with co-factor works in a substantial number of proteins of delegate metabolism, hormone discharge pathways and immune defense mechanism. Zn is engaged with guideline of small intestinal, thymus and hepatocytes quality articulation. (Tako *et al.*, 2003) MTF-I (Metal Responsive component Factor-I) is a Zn subordinate transcriptional activator directs mettallothionin I and II through MRE (Menard, 1981). Zn subordinate KLF4 interpretation factor is associated with protein planning of HT-29 cells. The other protein have Zn in it as constituents are ATP feelings, cytochrome c, a, NADP dehydrogenase I and II directed by Zn.

Protein

Protein (16g/100g) is fundamental for development, to create resistance, typical upkeep of body capacity and structure separated from multiplication and generation. The function of protein in body is not just at full macro level however it additionally works at gene dimension. An assortment or number of genes reacts to dietary protein both protein amounts just as quality impacts quality articulation. Insulin secretion was decreased in rodents, which are encouraged with low protein diet because of decrease in pancreatic b-cell mass lower reaction of remaining β-cells to supplements and brought down protein kinase activity (PKA). PKA is associated with capability of glucose actuated insulin secretion by gastrointestinal hormones, for example, GIP and GLP-1. Low protein diet nourishing to rodents modified the numerous quality articulation, which are in charge of proteins identified with insulin biosynthesis, secretion and cell redesigning. Ordinary insulin discharge is affected by dimension of Protein Kinase C (PKC), K⁺ channel protein, calcium particle (Ca²⁺) and PKAα. Expanded ATP to ADP proportion accomplished through glucose digestion, close the K⁺ ATP channel, which prompts depolarization of b-cells. Depolarized β-cells opens the voltage subordinate Ca²⁺ directs which results in flood of calcium prompts exocytosis of insulin granules. Encouraging low protein diet likewise expanded articulation of PFK in islets (tetramers M, P, L, and C) results in blemished glucose digestion; it further prompts expired glucose instigated insulin emission. Sustaining low protein diet diminishes insulin level; it additionally acts through diminished development of intracellular calcium.

Dietary fat

Fat present (5g/100g), unsaturated fats, notwithstanding their imperative job as vitality yielding supplements, may apply a noteworthy effect on the guideline of quality articulation (Jump *et al.*, 1999) ^[9]. A few rat examines demonstrate that dietary lipids weak the outflow of qualities in skeletal muscle, with an expansion in the errand person RNA (mRNA) articulation of qualities associated with unsaturated fat digestion after iso-vigorous high-fat weight control plans contrasted and low fat, high-starch slims down (Samec *et al.*,

1999) ^[20]. The impact of changed dietary fat admission on the declaration of qualities encoding proteins fundamental for unsaturated fat transport and β-oxidation in skeletal muscle has been reported. A fast and checked limit with respect to changes in dietary fatty acid accessibility to adjust the statement of mRNA-encoding proteins is essential for fatty acid transport and oxidative digestion. This finding is proof of supplement quality communications in skeletal muscle.

Carbohydrate

Estimated carbohydrate is (20g/100g), The role of dietary carbohydrate in weight gain has turned into an imperative inquiry in the public consciousness. Carbohydrates have been generally named basic (monomeric and dimeric) or complex (polymeric) based on their synthetic structure. A basic deformity of this characterization is its failure to predict the plasma glucose and insulin reactions related with various sorts of starches. The glycemic index, created two decades back (Jenkins *et al.*, 2002) ^[10] permits examination of various nourishments dependent on their physiologic impacts as opposed to on their chemical composition. A positive relationship between glycemic index and body weight has been appeared a few momentary trial studies and restricted observational investigations (Ludwig *et al.*, 1999) ^[13]. The possible biologic systems of glycemic index on body weight are believed to be identified with insulin levels, craving and satiation, and fundamental metabolic procedures (Roberts, 2000).

Folate

Folate (34.5µg/100g) is one of the B-group vitamins (like niacin) and is basic for the amalgamation (making) of the nucleic acid RNA and DNA. It is additionally associated with DNA replication and fix. Folate goes about as a co-factor for some, compounds, enabling them to catalyze response. Folate can likewise influence how DNA is translated to mRNA and afterward to proteins that is gene expression. For instance, a supplement called folate, which is found in green vegetables, citrus, entire green grains and bread is basic for making DNA and RNA.

Conclusion

Nutrigenomics is the investigation of impact of dietary bioactive segments on genome to modify quality articulation and at last phenotype. We eat a complex sustenance which contains various supplements. Insufficiency or over abundance of specific supplements prompts diseased or healthy body. Satisfactory dietary supplements anticipate or postpone endless scatters as well as decline the movement and seriousness of perpetual sicknesses. The test for nutrigenomics analyst is to find the qualities and their relationship to consume fewer calories that are associated with the advancement of endless maladies. In not so distant future nutrigenomics analyst will almost certainly give customized nourishment as per person's genotype.

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