Editorial Corner

From Nutrigenetics to Personalised Nutrition

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Over the past decade, rapid development in the field of genetic epidemiology has allowed the discovery and better description of genetic variations and their contributions to various chronic diseases such as obesity, cancer, Cardiovascular Disease (CVD) and diabetes. Research in the field of nutrition has shifted its attention from physiology to genetic epidemiology, which includes nutrigenetics and nutrigenomics that refer to the effects of genetic variation on dietary responses and the roles of nutrients and bioactive food compounds in gene expression, respectively. Although individuals may share the same genome, it is estimated that there are more than 10 million Single Nucleotide Polymorphisms (SNPs) that are present in at least 1% of the population. However, only a small proportion of SNPs have a functional effect. Therefore, the aim of nutrigenetics research is to determine how combinations of different SNPs may affect individual variations in response to diet, including metabolic responses to particular nutrients, specific nutritional requirements and susceptibility to disease outcomes. By understanding the genetic basis for individual variations in response to diet, a more accurate measure of the effects on health and disease risk can be determined. This then not only allows personalised dietary interventions for genetically predisposed individuals, but can also improve public health recommendations based on scientific evidence linking specific dietary components to health outcomes.

Nutrigenetics is still quite a new research area and standardized protocols are not well-established. Most often, results are difficult to replicate among populations due to population stratification, making conclusions difficult to draw. Perhaps, using prospective genotyping can increase the power to determine associations. Publication bias results in positive associations being reported more often than negative associations, giving false positives on the significance level of nutrient-gene interactions. While most studies only consider one SNP per gene, personalised nutrition requires the knowledge of multiple gene-nutrient-environment interactions from haplotype databases and biobanks to allow more complete understanding of nutrigenetics. Investment in these databases is necessary for nutrigenetics to progress and serve its purpose in public health nutrition.

The inter-individual variability in the response to a diet is particularly evident in South Asian and Southeast Asian countries that have diverse ethnic backgrounds, and have undergone a rapid socio-economic transition. It has become apparent that the epidemiologic transition has not affected all ethnic groups equally, particularly in relation to metabolic and CVDs. As has been observed in several other populations, Asian Indians and Pakistanis appear to be at high risk of Type 2 diabetes and CVDs. The rate of myocardial infarction in South Asians is threefold than that of Chinese. Obesity is most common amongst the Malays with the pattern of fat distribution being more peripheral. A recent study shows that Thais have more tendency to become obese, as the country now ranks third in ASEAN for the most people with obesity. In contrast, Asian Indians have a larger waist circumference and an elevated insulin resistance. Given that environmental factors such as unhealthy diet and physical inactivity play an important role in

the pathogenesis of the chronic diseases such as obesity and diabetes, it seems unlikely that genetic differences per se underlie these ethnic differences.

Nutrigenetics is a fairly new area of public health nutrition that goal is to determine interactions between individual genetic variation (SNPs) and response to diet and the association with a disease or trait. The 'one size fits all' approach in disease management has not been fully effective, as public health recommendations fail to result in appreciable benefit to individual. However, with advancement of nutrigenetics research, a progression from treatment to early risk detection and prevention based on individual's genetic predisposition seems achievable. Use of evidence-based approach is very important in nutrigenetics and in order to provide more scientific evidence between diet-gene interactions, there is a need for more studies and more variety in examined populations. Nutrigenetics has highlighted the complexity of those interactions but it offers opportunities to re-evaluate criteria used to set dietary guidelines and the contribution of genetic variation to optimal nutrition for individuals. If the interactions between genetic variation and nutritional requirements are better understood, dietary recommendations could be personalised according to genotype to ultimately promote health and reduce disease risk.

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