Nutritional genomics

Nutrients in our diet affect how our bodies function and our overall health. Components of a diet can influence how genes are switched on and off, whilst genetic variation between individuals can mean that these responses vary from person to person. Better understanding of these processes could potentially allow more effective and personalised approaches to diet and nutrition.

What is it?

Nutritional genomics research can take two different formats, often complementing each other.

Nutrigenomics assesses how nutrition affects genome regulation.

Nutrigenetics investigates specific genetic variants that regulate nutritional processes.

Genomics and other 'omics' technologies can be used along with measures of food intake and phenotypic, clinical and behavioural data to identify genes and genetic responses linked to nutrition.

The results may help develop nutritional advice or interventions, based on the direct genetic analysis of a person or by delivering tailored advice to populations with a high likelihood of a specific genotype or genomic response.

How could it help?

Examples of potential utility are:

Risk assessment
Obesity prevention strategies could focus on people at higher genetic risk, such as carriers of a common variant in the *APOA2* gene who have increased obesity risk when they eat high amounts of saturated fat.

Personalising health advice
Using genome analysis along with other biomarkers could help identify the most suitable meal types for people with type 2 diabetes, whose blood sugar levels respond differently to different food types.

Identifying genetic disorders
Some, often rarer, genetic variants are linked to conditions requiring specific diets to correct or control symptoms. Genetic analysis could identify these conditions and potentially develop new treatments.

Ready for patients?

Whilst some genetic variants clearly cause specific, often rare, health conditions, genetic analysis is still not always necessary to make a diagnosis.

For common complex conditions, such as obesity and many cancers, in which multiple factors play a part, the likely impact of nutritional genomic analysis is unclear. It is far from certain that nutritional interventions based on genetic information have any impact on population or individual health. When it comes to what we eat, social cultural and emotional factors must also be taken into account, especially where behaviour change is needed.

In such a complex field, robust randomised controlled trials are difficult to design. Where they have generated clear evidence, ensuing recommendations are often similar to existing dietary advice.

Outlook

Genes have been linked to nutrition, but there is little robust analysis of their effects, especially in different populations. Whilst direct-to-consumer tests exist, the vast majority are based on very uncertain evidence and aim to inform the general diets of relatively healthy individuals, where the benefits are particularly unclear.

Nutritional genomics, in combination with other diet-related analyses, might one day prove useful to improving nutrition in specific scenarios. For now, with research still in the early stages, it is too soon to confirm its utility in clinical care and public health practice.

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