The future of personalised nutrition: is phenotypic clustering the key?

C. Odonovan[1], M. C. Walsh[1], M. J. Gibney[1], E. R. Gibney[1] and L. Brennan[1]

[1]*Institute of Food & Health, University College Dublin, Ireland*

Personalised nutrition can be defined as giving tailored advice based on an individual's diet, phenotype or genetic profile. As this is an area still in its infancy, it is felt that there is insufficient evidence to deliver advice at an individual level. A more conservative approach would be to give advice at a group level, often referred to as 'targeted nutrition'. The objectives of this study were: to investigate whether cluster analysis can be used to identify groups or clusters in the population and to determine if this technique could be used to find certain groups who could be given specific/tailored dietary advice.

The present work was performed on biochemical data obtained from 1,500 free living adults as part of the National Adult Nutrition Survey (NANS). K-means clustering was used to identify groups based on blood markers of metabolic health (triglycerides, total-cholesterol, direct HDL-cholesterol and glucose) ($n = 875$). ANOVA with Bonferonni post hoc tests were performed to investigate differences between the groups, adjusting for age and gender.

The three clusters identified were found to be significantly different in terms of anthropometric measures such as body weight ($p = 2.22 \times 10^{-13}$), body fat (8.13×10^{-12}) and various biochemical markers including leptin ($p = 2.0 \times 10^{-3}$), leptin soluble receptor ($p = 2.57 \times 10^{-18}$) and adiponectin ($p = 1.27 \times 10^{-23}$). Cluster 3 had an 'at risk' metabolic profile with the highest levels in terms of BMI (29.26, SD = 4.67), insulin resistance (HOMA scores 3.71, SD = 3.99), TNF alpha (7.73, SD = 2.74) and the highest percentage of subjects with the metabolic syndrome (35.5%).

Phenotypic clustering can be used to identify adverse biochemical profiles in the Irish population using markers of metabolic health. This method could potentially be used in populations to identify metabolically 'at risk' groups that could be given specific dietary advice i.e. targeted nutrition.