Personalised nutrition perspectives - anti-inflammatory nutritional intervention selectively improves insulin sensitivity in overweight and obese adolescents wherein baseline metabotype predicts response

Connaughton RM[1], McMorrow AM[1], Healy ML[2], McGillicuddy FC[1], Lithander FE[3] and Roche HM[1]

[1]Nutrigenomics Research Group, UCD Conway Institute of Biomolecular and Biomedical Research, School of Public Health and Population Science, University College Dublin, Belfield, Dublin, Ireland; [2] Department of Endocrinology and Diabetes, St. James's Hospital, Dublin 8, Ireland; [3] ANU College of Medicine, Biology and Environment The Australian National University, Canberra ACT 0200, Australia

Introduction: Anti-inflammatory nutritional approaches may attenuate obesity-induced insulin resistance. However, results from clinical studies are not entirely consistent, warranting increased focus on determinants of inter-subject variability particularly within young cohorts at high-risk. Baseline metabotype may partially discriminate responders from non-responders.

Methods: Metabolic effects of an anti-inflammatory nutritional supplement containing LC n-3 PUFA, vitamin C, vitamin E, and polyphenols, were determined in overweight and obese adolescents (n=58; mean±SD age 15.9±1.6y; BMI 32.1±6.5kg/m^2) by an 8-wk randomised, crossover, placebo-controlled intervention. Subjects who demonstrated >10% improvement in HOMA-IR were categorised as responders.

Results: Anti-inflammatory nutritional supplementation selectively reduced HOMA-IR in 40% of subjects (responders; supplement -32.05±18.02% v placebo 13.13±54.09%, p=0.004). In comparison with non-responders, responding subjects demonstrated an adverse pre-treatment metabotype characterised by increased HOMA-IR, total cholesterol and LDL cholesterol despite similar BMI (p=0.001, p=0.029, p=0.024, p=0.236, respectively). Stepwise multiple regression analysis confirmed baseline HOMA-IR and LDL:HDL ratio as significant independent predictors of HOMA-IR response to anti-inflammatory supplementation (R^2=0.432, p<0.001). On-going analysis is defining the molecular basis of the differential response.

Conclusion: These results demonstrate heterogeneity with respect to the insulin sensitising effects of anti-inflammatory nutritional supplementation. Despite similar BMI to non-responders, the insulin resistant and dyslipidaemic metabotype of responders enhanced the impact of anti-inflammatory nutritional approaches. This illustrates potential efficacy optimisation within the context of personalised nutrition.

This trial was registered at clinicaltrials.gov as NCT01665742.