

Transcriptional changes in prostate of men on active surveillance following a 12-month glucoraphanin-rich broccoli intervention – results from the ESCAPE study.

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Background: Epidemiological evidence suggests that consumption of cruciferous vegetables, rich in the specialised plant metabolite glucoraphanin, is associated with reduced risk of prostate cancer progression. In this study, we set out to determine whether consumption of a glucoraphanin-enriched broccoli soup leads to changes in gene expression in prostate tissue, consistent with a reduction in risk of cancer progression.

Methods: 49 men on active surveillance were recruited into a randomised double-blinded intervention study for 12-months and underwent transperineal template biopsy and dietary assessment at the start and end of the study. Patients received a weekly 300 ml portion of soup made from a standard broccoli (control) or from one of two experimental broccoli genotypes with enhanced levels of glucoraphanin, equivalent to three and seven times that found in the standard broccoli. Gene expression in tissues from each patient obtained before and after the dietary intervention was quantified by Illumina RNA sequencing followed by gene set enrichment analyses.

Results: In the control arm, there were several hundred changes in gene expression in non-neoplastic tissue during the 12-months. These were associated with the increase in expression of potentially oncogenic pathways including inflammation processes and epithelial-mesenchymal-transition. Changes in gene expression were greatly attenuated in men that received the glucoraphanin-enriched broccoli soup in a dose dependent manner. While the study was not powered to assess clinical progression, we observed an inverse association between consumption of cruciferous vegetables, their S-containing metabolites and cancer progression.

Conclusions: Consuming glucoraphanin-enriched broccoli soup has a profound effect on transcriptional changes in the prostate that are consistent with a reduction in risk of cancer progression. This study supports the need for a further trial to specifically quantify clinical endpoints of prostate cancer progression.

Conflict of Interest: Mithen is an inventor in a patent for the development of broccoli with elevated glucoraphanin. Mithen, Traka and Melchini are co-inventors in two patents that cover combinations of a composition comprising glucoraphanin and SMCSO for the treatment or prevention of prostate cancer.

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