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Single nucleotide polymorphisms associated with carotenoid bioavailability.

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Carotenoids are plant bioactives assumed to participate in the beneficial effects against degenerative diseases attributed to plant products. Their absorption efficiency is very variable among individuals. We hypothesized that this is due, at least in part, to genetic variations between individuals. We thus dedicated a clinical study to identify minor genetic variants associated with carotenoid bioavailability.
Healthy male adults (n=40) consumed, at a minimum of 3 weeks intervals, 2 meals that contained either tomato purée (as a source of lycopene and β-carotene) or a lutein supplement. Volunteers were genotyped using whole-genome microarrays. Carotenoid concentrations were measured in plasma chylomicrons isolated at regular time intervals over 8 h postprandial. Partial Least Squares (PLS) regression was used to identify combinations of single nucleotide polymorphisms (SNPs) associated with the variability in carotenoid levels (AUC of the postprandial chylomicron carotenoid concentration).

The carotenoid responses were highly variable among the subjects (CV = 105 % for β-carotene, 75 % for lutein and 70 % for lycopene) and were significantly correlated with fasting plasma carotenoid concentrations. PLS models, which included between 12 and 16 genes and between 25 and 29 SNPs, explained a significant part (69% to 73%) of the variance of the carotenoid responses. Combinations of SNPs are associated with interindividual variation in carotenoid bioavailability which apparently affects the long term carotenoid status. Our results allow us to propose genetic scores that may predict the ability of a subject to accurately absorb these plant bioactives. This is a first step toward personalize recommendations in carotenoid intake.