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Genetic variations are involved in the bioavailability of antioxidant vitamins and micronutrients: towards personalized recommendations in antioxidant intake.

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Purpose – Antioxidant vitamins (A, C and E) and antioxidant micronutrients (carotenoids and polyphenols), are assumed to diminish the incidence of several degenerative diseases. However, absorption efficiency of these compounds is very variable among individuals. We hypothesized that this inter-individual variability is due to genetic variations between individuals. We thus dedicated a clinical study to identify genetic variants associated with fat-soluble antioxidant bioavailability.

Methods – 40 healthy male adults consumed, at a minimum 3 wks intervals, meals that contained either a supplement of vitamin E, a supplement of lutein or a tomato purée (as a source of lycopene and β -carotene). Volunteers were genotyped using whole-genome microarrays. Antioxidant concentrations were measured in plasma chylomicrons (CM) isolated at regular time intervals over 8 h postprandially. The association of single nucleotide polymorphisms (SNPs), in or near candidate genes, with the postprandial CM antioxidant responses was assessed by partial least squares (PLS) regression.

Results - The postprandial CM antioxidant responses to the antioxidant rich test-meals were highly variable among the subjects (CV > 80%). Data obtained allowed us to generate validated significant PLS models, which usually included 20-40 SNPs, and which explained a significant part of the variance of the postprandial CM antioxidant responses.

Conclusions – Minor genetic variants are associated with bioavailability of the studied antioxidants. This partly explains the huge interindividual variability in absorption efficiency of these compounds. Our results allow us to propose genetic scores that may predict the ability of a subject to accurately absorb these antioxidants. This is a first step toward personalize recommendations in antioxidant vitamin and micronutrient intake.