

Lactose Intolerance (LCT-13910C>T) Genotype Is Associated with Plasma 25-Hydroxyvitamin D Concentrations in Caucasians: A Mendelian Randomization Study.

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Abstract

Background: The *LCT*-13910C>T gene variant is associated with lactose intolerance (LI) in different ethnic groups. Individuals with LI often limit or avoid dairy consumption, a major dietary source of vitamin D in North America, which may lead to inadequate vitamin D intake. **Objective:** The objective was to determine the prevalence of genotypes predictive of LI in different ethnic groups living in Canada and to determine whether the *LCT* genotype is associated with plasma 25(OH)D concentrations. **Methods:** Blood samples were drawn from a total of 1495 men and women aged 20-29 y from the Toronto Nutrigenomics and Health Study for genotyping and plasma 25(OH)D analysis. Intakes of dairy were assessed by using a 196-item food frequency questionnaire. The prevalence of *LCT*-13910C>T genotypes was compared by using χ^2 analysis. Using a Mendelian randomization approach, we examined the association between *LCT* genotypes and 25(OH)D concentrations. **Results:** Approximately 32% of Caucasians, 99% of East Asians, 74% of South Asians, and 59% of those with other or mixed ethnicities had the CC genotype associated with LI. Compared with those with the TT genotype, those with the CC genotype had a lower mean \pm SE total dairy intake (2.15 ± 0.09 compared with 2.67 ± 0.12 servings/d, $P = 0.003$), a lower skim-milk intake (0.20 ± 0.03 compared with 0.46 ± 0.06 servings/d, $P = 0.0004$), and a lower plasma 25(OH)D concentration (63 ± 1.9 compared with 75.8 ± 2.4 nmol/L, $P < 0.0001$). The CT and CC genotypes were associated with a 50% and a 2-fold increased risk, respectively, of a suboptimal plasma 25(OH)D concentration (<75 nmol/L). **Conclusions:** In Caucasians, the CC genotype that predicts LI is associated with a lower plasma 25(OH)D concentration, which is attributable at least in part to a lower intake of dairy, particularly skim milk. Increased risk of suboptimal concentrations of vitamin D was also observed among those with the CT genotype, suggesting an intermediate effect of the heterozygous genotype.

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KEYWORDS: Mendelian randomization; genetics; lactose intolerance; nutrigenetics; nutrigenomics

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