Intake of up to 3 Eggs/Day does not Impact Expression of Genes Related to Cholesterol Homeostasis, Uptake, and Transport in a Healthy Population

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Abstract

Objective: Eggs are a main dietary source of cholesterol and choline, two nutrients that have at times been controversial. In both cases, the nutrient itself – or its byproduct(s) – is capable of regulating the expression of genes related to the risk for cardiovascular disease (CVD). Therefore, concern exists as to whether regular egg intake may unfavorably alter these pathways and increase CVD risk. Pathways of concern include cholesterol synthesis (3-hydroxy-3-methylglutaryl coenzyme A reductase – HMGCR;24-dehydrocholesterol reductase – DHCR24), cholesterol transport (ATP-binding cassette transporter - ABCA1; LDL receptor - LDLR; scavenger receptor B1 - SCARB1), macrophage cholesterol uptake (cluster of differentiation 36 - CD36; scavenger receptor A - SRA), and synthesis of trimethylamine-N-oxide (TMAO), a choline-derivedproatherogenic compound and product of flavin monoxygenase 3(FMO3).

Methods: To examine these pathways, 38 young, healthy individuals (age 24.2 ± y, BMI 24.2 ± 2.3 kg/m_2) underwent a 2-week egg-free washout followed by intake of 1, 2, and 3 eggs/ day for 4 weeks each. Peripheral blood mononuclear cells (PBMC) were isolated following each dietary period for analysis of gene expression using qRT-PCR.

Results: Egg intake did not impact expression of HMGCR, LDLR, SCARB1, CD36, or FMO3, though expression of SCARB1 was positively correlated with HDL cholesterol ($r = 0.499$, $p = 0.0002$). Expression of ABCA1, DHCR24, and SRA was not detectable in PBMC in this population, suggesting that egg intake did not have any measurable impact on these genes.

Conclusion: Overall, these results suggest that intake of up to 3 eggs/day does not impact expression of genes related to cholesterol homeostasis, uptake, or plasma TMAO, resulting in no change in these pathways associated with CVD risk in a young, healthy population.