

## Vitamins and Minerals

### No Association Between Riboflavin and Choline Status in a Sample of Canadian and Malaysian Women of Reproductive Age

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**Objectives:** Riboflavin and choline are essential nutrients that are metabolically inter-related and play major roles in one-carbon metabolism. Betaine can donate a methyl group to homocysteine, forming dimethylglycine (DMG) and methionine in the liver and kidney. Betaine is synthesized from choline in two irreversible reactions, the first of which is catalyzed by flavin adenine dinucleotide (FAD), a cofactor formed from riboflavin. In animal models, riboflavin status has been shown to influence choline and its metabolites betaine and DMG but there are no human studies. Here we examine whether riboflavin status modifies plasma choline, betaine, and DMG concentrations in healthy women (19–45 y).

**Methods:** Fasting blood was collected from 206 Canadian and 210 Malaysian women between 2015 and 2016. Riboflavin status was assessed using a functional biomarker, erythrocyte glutathione reductase activity coefficient (EGRac). Plasma choline, betaine, and DMG were determined by LCLC MS/MS. Plasma folate and vitamin B12 were determined using the microbiological method and an immune assay, respectively. General linear models were used to assess the independent relationship between EGRac and each of the choline metabolites with adjustment for potential confounders.

**Results:** 71% of Malaysian women had EGRac  $\geq 1.40$  compared to 40% of Canadian women. Betaine, DMG, and vitamin B12 concentrations were significantly higher among Malaysian women compared to Canadian women (40.6 vs. 37.0 mmol/L, 2.7 vs. 2.4 mmol/L and 360 vs. 307 pmol/L, respectively). There were no significant associations between EGRac or riboflavin deficiency (defined as EGRac  $\geq 1.40$ ) and choline or its' metabolites after adjustments for age, ethnicity, body mass index, plasma folate, and vitamin B12. In the adjusted models, plasma choline was positively associated with vitamin B12 concentrations (B = 0.002, 95% CI: 0.000, 0.003) and plasma betaine was positively associated with plasma folate (B = 0.18, 95%CI: 0.07, 0.29) and vitamin B12 (B = 0.011, 95%CI: 0.002, 0.020).

**Conclusions:** Overall, riboflavin status was not associated with choline and its metabolites in Canadian and Malaysian women.

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