THE EFFECTS OF FOLATE DEPLETION ON PLASMA PHOSPHATIDYLCHOLINE

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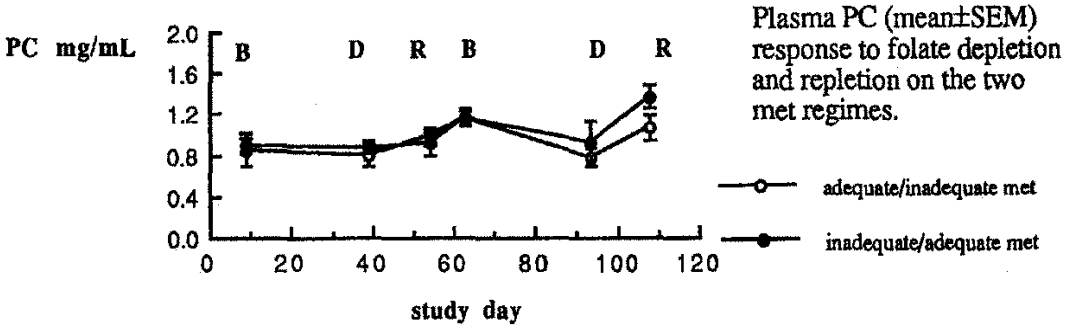
As part of a larger study into the requirements for folate in humans with diets low in exogenous methyl groups (ie. methionine and choline) we examined the effect of folate depletion on the phospholipid (PL) pattern in plasma. Phosphatidyl choline (PC) accounts for 65 to 70% of the human plasma PL and it is either synthesised directly from dietary choline or formed by methylation of phosphatidylethanolamine (PE) in the liver. Hepatic s-adenosyl methionine (SAM) provides the three methyl groups necessary for the formation of PC from PE. Folic acid is involved in the generation of the SAM pool. It was hypothesised that a diet which was deficient in folate would lead to a reduction in the plasma PC concentrations via its effect on the supply of methyl groups and that if the diet was also low in methionine (met) and choline the reduction in plasma PC would be exacerbated.

Eleven healthy males with a mean age of 38±4.5 (SD) years participated. Throughout the study they were housed in the metabolic ward at the US Department of Agriculture's Western Human Nutrition Research Center. Subjects were randomly allocated to one of two groups. Both groups were fed a baseline diet (B) for nine days (d) containing adequate amounts of all micronutrients (folate content was 440µg/d). Subjects were then fed a folate (25 µg/d) depleting diet (D) and either 1) adequate in met (1,400mg/d) or 2) inadequate in met (500 mg/d). After 30d on this regime the subjects were supplemented with 94µg folate (pteroylglutamic acid) added to their diet (R) for 15d in order to replete the folate stores. Subjects then returned to the B regime for 9d at which time they crossed over to repeat the D and R but received the alternative met regime. Blood samples were drawn at the end of each of the six dietary periods. The plasma lipids were extracted and the individual PLs of the plasma were separated using thin layer chromatography. The amount of PC was quantitated using Bartlett's method (1959). The PC concentrations at the end of each dietary period were compared using one way analysis of variance (ANOVA) and the source of variation located using Scheffe's test. The differences between the two levels of met were compared with two way ANOVA.



Plasma PC (mean±SEM) response to folate depletion and repletion on the two met regimes.

Regardless of whether the subjects received adequate or inadequate amounts of met no changes in plasma PC occurred during the initial D and R. A decrease in plasma PC during folate depletion ($P<0.05$) and an increase on subsequent repletion ($P<0.01$) occurred in the second phase. These changes occurred on both the inadequate and adequate met diets. The lack of effect in the initial phase might result from a lesser degree of folate depletion occurring here than in the second phase.

In conclusion, depletion of folate may result in decreases of plasma PC. The hepatic secretion of LDL may be impaired by folate deficiency either through reduced synthesis of PC and/or apoproteins. It is also possible that de novo synthesised PC is not secreted into the plasma but might be retained in the liver because of reduced hepatic synthesis of lipoproteins.

BARTLETT G. (1959). J. Biol. Chem. 234: 466.

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