COMBINED DIETARY VITAMINS $B_6$, $B_{12}$, AND FOLATE INCREASE PLASMA CHOLINE LEVELS IN RATS

N. van Wijk$^1$, C.J. Watkins$^2$, M. Böhlke$^2$, T.J. Maher$^{2,3}$, P.J. Kamphuis$^1$, L.M. Broersen$^1$

$^1$Nutricia Advanced Medical Nutrition, Danone Research, Wageningen, The Netherlands, $^2$Dept. of Brain and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, $^3$Dept. of Pharmaceutical Sciences, Massachusetts College of Pharmacy and Health Sciences, Boston, MA, USA

Introduction: Choline is an essential nutrient for humans and is required for the synthesis of choline-containing phospholipids, acetylcholine and the methyl-donor betaine. Choline is not only derived from the diet, but also from de novo synthesis, via sequential methylation of phosphatidylethanolamine to phosphatidylcholine (PC) by phosphatidylethanolamine-N-methyltransferase (PEMT). Choline is liberated from the newly formed PC and released into the bloodstream. Vitamin $B_6$, $B_{12}$, and folate supplementation may support the PEMT pathway by both enhancing regeneration of methionine and reducing homocysteine levels. An alternative pathway for regeneration of methionine from homocysteine is provided by betaine-homocysteine methyltransferase which utilizes choline. Hence, B-vitamins may not only increase endogenous choline synthesis through the PEMT pathway, but may also decrease choline utilization by the betaine-homocysteine methyltransferase pathway. We now studied whether B-vitamin supplementation affects plasma choline availability.

Methods: Rats were fed different diets specific in vitamin $B_6$, $B_{12}$, and folate:

1) B-vitamin poor;

2) B-vitamin enriched.

First, a mild B-vitamin deficiency was induced in all rats by feeding the B-vitamin poor diet for 4 weeks. Second, animals either continued on the B-vitamin poor diet or switched to the B-vitamin enriched diet for another 4 weeks. Third, rats were sacrificed and plasma was collected for analysis of free choline and homocysteine.

Results: Dietary enrichment with B-vitamins significantly increased plasma choline levels up to 110% of control. In addition, the B-vitamin enriched diet significantly decreased plasma homocysteine levels.

Conclusion: B-vitamins may be required to sustain optimal choline levels for precursor availability for synthesis of phospholipids and acetylcholine.