Vision Issues and Space Flight: Evaluation of One-Carbon Metabolism Polymorphisms

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Intermediates of the one-carbon metabolic pathway are altered in astronauts who experience vision-related issues during and after space flight. Serum concentrations of homocysteine, cystathionine, 2-methylcitric acid, and methylmalonic acid were higher in astronauts with ophthalmic changes than in those without (Zwart et al., *J Nutr*, 2012). These differences existed before, during, and after flight. Potential confounding factors did not explain the differences. Genetic polymorphisms could contribute to these differences, and could help explain why crewmembers on the same mission do not all have ophthalmic issues, despite the same environmental factors (e.g., microgravity, exercise, diet). A follow-up study was conducted to evaluate 5 polymorphisms of enzymes in the one-carbon pathway, and to evaluate how these relate to vision and other ophthalmic changes after flight. Preliminary evaluations of the genetic data indicate that all of the crewmembers with the MTRR GG genotype had vision issues to one degree or another. However, not everyone who had vision issues had this genetic polymorphism, so the situation is more complex than the involvement of this single polymorphism. Metabolomic and further data analyses are underway to clarify these findings, but the preliminary assessments are promising.