The study of choline provides insight into a varied array of nutrigenetic mechanisms that are clinically relevant for infant development

Diet-Gene Interactions Underlie Metabolic Individuality and Influence Brain Development: Implications for Clinical Practice Derived from Studies on Choline Metabolism

by Steven H. Zeisel

Key insights
This article highlights studies that illustrate the utility of genetic and metabolomic profiling, particularly looking at the human dietary requirement for, and the responses to, choline. It discusses the interaction of genes and maternal/infant diet, both of which can alter epigenetic marks that control gene expression throughout life.

Current knowledge
Genetic variation is one of the underlying mechanisms of metabolic individuality. Genetic polymorphisms, detected by genetic profiling, modify dietary requirements by creating metabolic inefficiencies, which are detected by using metabolomic profiling. In adults, these polymorphisms determine whether people develop fatty liver, liver damage, and/or muscle damage when eating low-choline diets. Choline is also important for fetal development of the brain. Some of the actions of choline are mediated by epigenetic mechanisms, which may permit the ‘retuning’ of metabolic pathways during early life.

Practical implications
A better understanding of important nutrient-gene interactions and nutrigenetic profiling can help clinicians to identify people with metabolic inefficiencies, and, in particular, identify women who need to eat more choline during pregnancy. Because the metabolic variation is a source of variance (noise), it should be considered in the design of future human nutrition research studies.

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