Abstract


High vitamin A intake during pregnancy modifies dopaminergic reward system and decreases preference for sucrose in Wistar rat offspring.


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OBJECTIVE: High multivitamin (HV) content in gestational diets has long-term metabolic effects in rat offspring. These changes are associated with in utero modifications of gene expression in hypothalamic food intake regulation. However, the role of fat-soluble vitamins in mediating these effects has not been explored. Vitamin A is a plausible candidate due to its role in gene methylation. Vitamin A intake above requirements during pregnancy affects the development of neurocircuitries involved in food intake and reward regulation.

METHODS: Pregnant Wistar rats were fed AIN-93G diets with the following content: recommended multivitamins (1-fold multivitamins: RV), high vitamin A (10-fold vitamin A: HA) or HV with only recommended vitamin A (10-fold multivitamins, 1-fold vitamin A: HVRA). Body weight, food intake and preference, mRNA expression and DNA methylation of hippocampal dopamine-related genes were assessed in male offspring brains at different developmental windows: birth, weaning and 14weeks postweaning.

RESULTS: HA offspring had changes in dopamine-related gene expression at all developmental windows and DNA hypermethylation in the dopamine receptor 2 promoter region compared to RV offspring. Furthermore, HA diet lowered sucrose preference but had no effect on body weight and expression of hypothalamic genes. In contrast, HVRA offspring showed only at adulthood changes in expression of hippocampal genes and a modest effect on hypothalamic genes.

CONCLUSION: High vitamin A intake alone in gestational diets has long-lasting programming effects on the dopaminergic system that are further translated into decreased sucrose preference but not food intake.

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