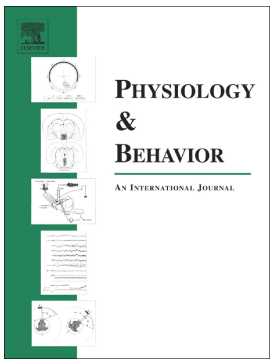

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Maternal exposure to Western diet affects adult body composition and voluntary wheel running in a genotype-specific manner in mice

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Abstract

Some human diseases, including obesity, Type II diabetes, and numerous cancers, are thought to be influenced by environments experienced in early life, including *in utero*. Maternal diet during the perinatal period may be especially important for adult offspring energy balance, potentially affecting both body composition and physical activity. This effect may be mediated by the genetic background of individuals, including, for example, potential "protective" mechanisms for individuals with inherently high levels of physical activity or high basal metabolic rates. To examine some of the genetic and environmental factors that influence adult activity levels, we used an ongoing selection experiment with 4 replicate lines of mice bred for high voluntary wheel running (HR) and 4 replicate, non-selected control lines (C). Dams (half HR and half C) were fed a "Western" diet (WD, high in fat and sucrose) or a standard diet (SD) from 2 weeks prior to mating until their pups could feed on solid food (14 days of age). We analyzed dam and litter characteristics from birth to weaning, and offspring mass and physical activity. One male offspring from each litter received additional metabolic and behavioral tests. Maternal WD caused pups to eat solid food significantly earlier for C litters, but not for HR litters (interaction of maternal environment and genotype). With dam mass as a covariate, mean pup mass was increased by maternal WD but litter size was unaffected. HR dams had larger litters and tended to have smaller pups than C dams. Home-cage activity of juvenile focal males was increased by maternal WD. Juvenile lean mass, fat mass, and fat percent were also increased by maternal WD, but food consumption (with body mass as a covariate) was unaffected (measured only for focal males). Behavior in an elevated plus maze, often used to indicate anxiety, was unaffected by maternal WD. Maximal aerobic capacity (VO_2max) was also unaffected by maternal WD, but HR