Abstract

Emerging evidence suggests environmental chemical exposures during critical windows of development may contribute to the escalating prevalence of obesity. We tested the hypothesis that prenatal air pollution exposure would predispose the offspring to weight gain in adulthood. Pregnant mice were exposed to filtered air (FA) or diesel exhaust (DE) on embryonic days (E) 9-17. Prenatal DE induced a significant fetal brain cytokine response at E18 (46-390% over FA). As adults, offspring were fed either a low-fat diet (LFD) or high-fat diet (HFD) for 6 weeks. Adult DE male offspring weighed 12% more and were 35% less active than FA male offspring at baseline, whereas there were no differences in females. Following HFD, DE males gained weight at the same rate as FA males, whereas DE females gained 340% more weight than FA females. DE-HFD males had 450% higher endpoint insulin levels than FA-HFD males, and all males on HFD showed decreased activity and increased anxiety, whereas females showed no differences. Finally, both DE males and females on HFD showed increased microglial activation (30-66%) within several brain regions. Thus, prenatal air pollution exposure can "program" offspring for increased susceptibility to diet-induced weight gain and neuroinflammation in adulthood in a sex-specific manner.

Keywords: high-fat diet, cytokines, microglia, prenatal programming, diesel exhaust