Numerous studies in humans and animal models have demonstrated that maternal morbid obesity is associated with subfertility, intrauterine growth retardation, and an increased risk of metabolic abnormalities in the offspring. However, it is not known if the critical window of exposure occurs prior to (oocyte) or during in-utero development. We hypothesized that the phenotypes observed in the offspring of obese dams were due to the effects of maternal obesity on the oocyte prior to pregnancy. As previously reported by others, oocyte quality was significantly poorer in diet induced obese (DIO) dams compared to controls. The number of oocytes that failed to undergo maturation (GVBD) was 25% in DIO dams vs. 4% in controls. In addition, 10% of DIO oocytes were degenerated vs. 0% in controls. Expression arrays in DIO oocytes showed differential expression of genes regulating pathways related to chromatin remodeling, RNA processing, mitochondrial metabolism, and embryonic growth. Our data suggest that pre-implantation exposure to a maternal HFD programs how the resulting progeny utilize nutrient resources.

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