**Greater propensity for adipogenesis and adipocyte hypertrophy in mesenchymal stem cells from infants of mothers with obesity**

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**Introduction**

- In maternal obesity, infants born with greater adiposity\textsuperscript{3}, but unclear if this is due to greater adipocyte number (hyperplasia) or size (hypertrophy) (Fig. 1).
- Animal models show maternal obesity induces adipocyte hypertrophy in offspring, mediated in part by ↑ Zfp423\textsuperscript{2}; unknown if this occurs in humans.
- Mesenchymal stem cells (MSCs) differentiate into fat cells (and other cell types); comparing MSCs from umbilical cords of human infants of mothers with obesity (Ob-MSCs) vs. normal weight mothers (NW-MSCs), we previously found ↑ adipogenesis in Ob-MSCs, correlated with adiposity at birth\textsuperscript{3}.
- Hypothesis: Adipocytes differentiating from Ob-MSCs will store more fat and be larger (hypertrophic) compared to adipocytes from NW-MSCs.

**Methods**

- Harvested MSCs from Healthy Start infants’ umbilical cords (Table 1).
- Used all 19 Ob-MSCs, 20 NW-MSCs matched for sex, gestational age, MSC time to confluence.
- Embedded MSCs in hydrogels for 3-Dimensional cell culture (Fig. 2).
- Induced adipogenesis in vitro for 14 days (Fig. 3).
- Stained with BODIPY (lipids), Wheat Germ Agglutinin (cell surface), and DAPI (nuclear stain).
- Imaged MSCs using confocal microscopy, quantified fluorescence with Fiji.
- Measured proteins (Fig. 7) with Simple Western (WES).
- Determined morphological differences between Ob-MSCs and NW-MSCs using t-test, tested protein pathway differences with MANOVA.

**Citations**


**Results**

- Ob-MSCs have 62% lower proliferation during adipogenesis.
- Ob-MSCs have higher levels of adipogenesis proteins, indicating they may be primed for adipogenesis.
- Ob-MSCs have 73% larger than NW-MSCs.
- Ob-MSCs store 72% more lipid.
- Greater propensity for adipogenesis and adipocyte hypertrophy in mesenchymal stem cells from infants of mothers with obesity.

**Discussion**

- Compared to NW-MSCs, Ob-MSCs: are larger and store more fat, have lower rates of proliferation early in adipogenesis, and have more adipogenic proteins before differentiation.
- Across all MSCs, adipogenesis measures are associated with neonatal body composition and serum cardiometabolic measures in childhood.
- Inherent propensity for adipocyte hypertrophy in infant MSCs may explain offspring predisposition for obesity and metabolic disease.

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