**ABSTRACT**

Objective: With childbirth, genitalic and epigenetic processes reorganize hypothalamic, limbic, and cortical circuits. Some brain parental brain circuits are common to mothers and fathers, yet vary in novelty according to gender and experience and postpartum timing. Parental brain activations are associated with adaptive parental thoughts and behaviors, some of which are part of obsessive-compulsive disorder (OCD), such as intrusive infant-worries and reported infanit-checks to ensure that things are "just right." In addition, reward and empathy are likely part of parenting responses. We thus hypothesize that the development of human parental attachment shares the same genetic and brain substrates as OCD, reward and empathy. Specific objectives include the following: 1) determine how parental brain activations to baby stimuli vary with gender and experience in striato-thalamo-cortical, and empathy circuits, 2) determine how measures of parental preocupations and parent-infant relationship impact parental brain activations.

**METHODS**

- We recruited biological parents + full-term, healthy infants in postpartum hospital rooms and then "naturalistic" digital baby images and cries were obtained within the first 2 weeks.
- We obtained parental MRI and psychometric data at 2 points: 2-4 weeks (time 1) and 3-4 months (time 2) postpartum.
- We used a high-field, gradient-echo planar functional magnetic resonance imaging (MRI) scanner (Siemens 3T Trio) while parents rated their emotional response during scanning, subjects pressed buttons (when prompted with a beep) to rate their emotional response
- This is the first longitudinal ongoing study to combine neuroimaging of brain regions in both mothers and fathers, with concurrent psychometric and endocrine measures. Human parenting involves habit, reward and empathy-related brain circuits.

**CONCLUSIONS**

- We show that it is feasible to selectively, robustly and reliably activate brain regions of new moms and dads with baby stimuli of own and other baby cries and photos.
- In response to other baby cry signals, combined groups of 1st time and veteran moms and dads activate brain circuits in sensory, emotion regulation, and empathy-regulating cortical areas (p<0.001).
- In response to own baby cry, specific regions of activation include frontal, basal ganglia, circulate, thalamus and brainstem — which may be interpreted to regulate OCD-like postpartum preoccupations and habits
- Across the first few months postpartum, new areas that become active to own baby cry including striatum, hypothalamsus and anterior cingulate (reward and hormone regulation).
- Grouping by gender relates less activity in dads compared with moms at the first time point, but over the first 3-4 months, dads develop many of the same brain responses to new baby cry.
- Experience, exemplified by having previous a previous child, results in activation of reward circuits by own baby cry
- Intervenes show: moms are more preoccupied than dads, 1st time parents more than veterans and more than 1 time to 2 parent preoccupations correlate with brain responses to own baby cry in brain regions important for social behaviors, empathy, anxiety, arousal and OCD.

**REFERENCES**