Title: Altered breastmilk hormone concentrations in non-diabetic, obese, exclusively breastfeeding women

Background: Maternal obesity increases the risk of child obesity by approximately 2 to 3-fold. One understudied mechanism is "lactational programming," or the transmission of hormones, cytokines, and other potentially bioactive constituents in breastmilk. While this has been shown in numerous animal models, the human literature is still unclear. Objective: To test the association of pre-pregnancy BMI, gestational weight gain (GWG), and pregnancy glycemia as predictors of breastmilk insulin and adiponectin in exclusively breastfeeding women. Design/Methods: Subjects were exclusively breastfeeding, non-diabetic, non-smoking mothers and their term, AGA, singleton infants (N=68 dyads), enrolled in the ongoing MILK cohort study. Mothers provided a single complete breast expression between 7:30 and 10:30 am using a hospital-grade electric breast pump, and the milk fat was separated from the aqueous phase by centrifugation. Milk insulin and adiponectin were assayed in the skimmed milk using commercially-available immunoassay kits. Maternal pre-pregnancy BMI, gestational weight gain (GWG) and oral glucose challenge (50g) test results (OGC) were obtained from the electronic health record and examined as predictors of milk hormones at 1 and 3 months in separate models. Hormones were log-transformed prior to analysis. Maternal BMI was modeled as a level variable (obese versus normal weight and overweight), while GWG, and OGC were treated as continuous variables in linear regression models adjusting for maternal age, parity, milk volume produced, infant gestational age at birth, sex, and birth weight. Results: There were 17 obese and 51 non-obese women with mean milk insulin of ~27 uIU/ml and mean milk adiponectin of ~15 ng/ml at both timepoints. Milk insulin was approximately 2-fold higher (p=0.0002) and milk adiponectin was somewhat lower (p=0.04) in obese compared to non-obese women at both 1 and 3 months. A scatter plot of insulin results at 1 month is presented (Figure 1) showing a continuous relationship. There was also a negative association between OGC test results and milk adiponectin at 3 months, but this did not reach statistical significance (p=0.054). Neither hormone was significantly associated with GWG. Conclusion(s): The present study suggests maternal obesity in the absence of diabetes is associated with higher insulin and lower adiponectin concentrations, which may be influenced as well by maternal pregnancy glycemia. Future work will assess relationships to infant growth, body composition, and metabolic health.
Figure 1. Association of maternal pre-pregnancy BMI with breast milk insulin concentration (log-transformed, uIU/ml) (R²=0.14), N=68