Abstract Title:

Metabolomic Differences between Mothers' Own Breast Milk and Donor Breast Milk

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Introduction: Human milk is nutritionally complete, is the ideal food for a newborn infant, and conveys many benefits to all infants including sick preterm infants. Mothers' own breast milk (MBM) has many advantages as it is tailored for the mother-infant couple. Donor breast milk (DBM) has been thought to be a reasonable alternative to MBM when MBM is unavailable. To our knowledge, no reports exist comparing donor breast milk to mothers' own breast milk at the biochemical and micronutrient level. In this study, we compared the composition of mothers' own breast milk to donor breast milk using a metabolomic approach.

Methods: Human milk samples were collected from mothers who were breastfeeding or providing milk to their healthy term or preterm infants at around two weeks after delivery (n=48). The milk samples were frozen and stored at -80°C until analysis. Donor breast milk samples (n=8) were taken from four

different lots supplied to our NICU. Human milk analysis was performed by Metabolon Inc. (Durham, NC). Global metabolomic profiles were analyzed and relative abundance of compounds were determined.

Results: A total of 720 biochemicals were identified in the breast milk samples, 565 of known identity and 155 of unknown structural identity. In principal component analysis, DBM samples tended to form a separate, but neighboring, population to the MBM groups. Using a threshold of significance at $p<0.05$, preterm MBM, compared to DMB, showed 165 compounds that had elevated abundance and 128 compounds that had decreased abundance; term MBM showed 181 biochemicals that had elevated abundance and 183 biochemicals that had decreased abundance. The majority of differences were seen in lipid pathways. Medium-chain fatty acids and long-chain fatty acids were decreased in abundance in term MBM compared to DBM; no significant differences were observed between preterm MBM and DBM for these biochemicals. Carnitine-conjugated fatty acids and complex lipids also had elevated abundance but monoacylglycerols had decreased abundance in MBM compared to DBM.

Conclusion: In summary, this comprehensive metabolomics study shows that the biochemical profiles of donor breast milk is distinctively different compared to MBM, particularly in the lipid metabolites. While the significance of these biological differences remains to be determined, this information provides the fundamental basis for future studies of human milk.