R³: Research, Read & Review

Literature dissemination by the NIDCAP and Science Sub-Committee

February 2022

Title	**Early breast milk exposure modifies brain connectivity in preterm infants**
Reference	Blesa M, Sullivan G, Anblagan D et al. Neuroimage. 2019;184: 431–439. doi.org/10.1016/j.neuroimage.2018.09.045
What is known about this topic?	• Preterm birth is strongly associated with a MRI phenotype characterized by alterations in structural connectivity in the white matter, structural alterations in cortical and deep grey matter, and long term neurocognitive impairment • Risks for atypical brain development are not fully explained by genetic and environmental factors nor by co-morbidities of prematurity • Nutritional factors play an important role in preterm infant brain development • Breastfeeding is associated with increased performance in intelligence testing among the general population • Outcome studies of preterm infants have reported improved neurodevelopmental outcomes in association with breast feeding
What does this paper add?	• In this cohort of preterm infants, microstructural properties of white matter tracts and cerebral structural connectivity were improved in association with higher exposure to breast milk • Exposure to breast milk was associated with improved markers of brain development and connectivity at term equivalent age • Breast milk intake during hospitalization might be critically important for optimal brain development of preterm infants
A summary	Data about neonatal breast milk exposure and brain MRI at term equivalent age was collected from 47 preterm infants

	(mean postmenstrual age 29.43 weeks). Network-Based Statistics (NBS), Tract-based Spatial Statistics (TBSS) and volumetric analysis were used to investigate the effect of breast milk exposure on white matter water diffusion parameters, tissue volumes, and the structural connectome. **27 infants received exclusive breast milk feeds for ≥75% of days of hospitalization**; this was associated with higher connectivity in the fractional anisotropy (FA)-weighted connectome, as compared with the group who had < 75% of days receiving exclusive breast milk feeds (p=0.04). Within the TBSS white matter skeleton, the group that received ≥75% exclusive breast milk days exhibited higher FA within different brain areas (the corpus callosum, cingulum cingulate gyri, centrum semiovale, corticospinal tracts, arcuate fasciculi and posterior limbs of the internal capsule), as compared with the low exposure group and after adjustment for several confounders. The effect on structural connectivity and tract water diffusion parameters was greater with ≥90% breast milk exposure, suggesting a dose effect. No differences were found in brain volumes between groups. Conclusions: Breast milk feeding in the weeks following preterm birth was associated with improved structural connectivity of developing networks and greater FA in major white matter fasciculi
What is the relevance to NIDCAP?	Findings from this study tap on the neuroprotective (and, perhaps, "neuroenhancer") effect that breast milk might exert on preterm infants' brain. Blesa et al. provide fascinating insights following a comprehensive assessment of brain development in this cohort of preterm infants (measures of connectivity, microstructure and brain volumes), and report about relationships to these infants' exposure to breast milk feeds. These relationships are, definitely, thought-provoking. NIDCAP-based care is a never-ending quest for strategies and ways to preserve and enhance developmentally appropriate, neuroprotective interventions for prematurely born infants. This study provides additional and innovative evidence of the benefits of human breast milk for preterm infants. One important role we have as caregivers, is to keep looking for practical, sensitive, and timely interventions to encourage mothers to provide breast milk to their infants in the NICU and beyond.