

Abstract Title:

Standing By Human Milk, Through Thick and Thin: The Effects of Thickeners on Human Milk Viscosity

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Introduction: Gastroesophageal reflux disease (GERD) is a common problem in preterm infants that often requires thickening of feeds. Clinically it has been ineffective to thicken human milk with starch-based thickeners (SBT). Gum-based thickeners (GBT) were frequently used until recent reports of necrotizing enterocolitis (NEC) in infants fed milk with these thickeners. Our objective is to measure the effect of various thickening strategies on the viscosity of human milk and preterm formula.

Methods: We thickened donor human milk (DHM) and formula using various thickeners: SBT, xanthan GBT, carob GBT or rice cereal. Each feed sample was thickened per product recommendations to achieve nectar or honey thick consistency. Baseline acidity (pH) of each sample were measured, then 0.1M HCl added to mimic stomach acidity. Room and body temperature were evaluated. DHM was tested with and without human milk fortifiers (HMF). Viscosity of the milk was measured using a rotary viscometer.

Results: DHM does not effectively thicken with SBT but did with all GBT. Xanthan GBT achieves higher viscosities than carob GBT. Neither subtypes of GBT had a linear relationship between quantity of thickener and resulting viscosity. Temperature and mild acidity had minimal effects on viscosity in any thickening combinations. The addition of acid to DHM thickened with Xanthan GBT produced marked

precipitation. Formula was thickened with all types of thickeners.

Conclusion: This is the first study to comprehensively measure viscosity of the thickening strategies to manage GERD in preterm infants. This study also accounts for multiple variables that may alter the efficacy of thickeners in a clinical setting. We not only characterized viscosity changes over time, but we also evaluated the relationship between quantities of thickener added and the resulting viscosity of the mixture. Incidentally, we discovered that Xanthan GBT-thickened DHM sample precipitates out, but carob GBT does not. Future studies should determine if the precipitation plays a role in NEC.