HUMAN DONOR MILK AND PROBIOTICS DIFFERENTIALLY SHAPE THE GUT MICROBIOME AND RISK FOR NECROTIZING ENTEROCOLITIS

Valeria Melendez Hebib¹, Diana Taft ², Nick Jensen³, Jinxin Liu³, Barbara Stoll⁴, Gregory Guthrie⁴, Lee Call⁴, Amy B. Hair⁵, David A Mills², Douglas G. Burrin⁴
¹ Baylor College of Medicine, Department of Pediatrics, Nutrition
² University of California, Davis, Food Science and Technology, N/A
³ University of California, Davis, University of California, Davis, N/A
⁴ Baylor College of Medicine, Pediatrics, Nutrition
⁵ Baylor College of Medicine, Pediatrics, Newborn

Keywords: HMO, Bifidobacterium, NEC

Background: Necrotizing enterocolitis (NEC) is the leading cause of death from gastrointestinal disease in preterm infants. Although the pathogenesis of NEC is not completely understood, prematurity, formula feeding, and dysbiosis of the intestinal microbiome have all been identified as risk factors for this disease. Probiotic administration has been associated with the reduction of NEC incidence in at-risk infants, as they have the potential to prevent dysbiosis. Bifidobacterium spp. have been associated with health benefits including maturation of the immune system and improvement of intestinal barrier function. The objective of this study was to evaluate the effect of dietary supplementation with Bifidobacterium longum subspecies infantis and a human milk oligosaccharide (HMO), sialyllactose (3’S1) on the incidence of NEC and the taxonomic composition of the gut microbiome in a preterm piglet model.

Materials/Methods: A total of 50 piglets were delivered at 90% gestation. During the 7-day study, piglets were assigned to one of five treatments: (1) Commercially available preterm infant formula (2) human donor milk (HDM), (3) Infant formula and HMO, (4) Infant formula and B. infantis, (5) Infant formula and B. infantis + HMO. NEC incidence and severity were assessed by evaluation and collection of tissue section from all segments of the GI tract. The gut microbiome composition was assessed both daily and terminally by 16S and whole genome sequencing (WGS) of stool samples and intestinal contents, respectively.

Results: Piglets fed a HDM diet were significantly protected against NEC compared to formula-fed piglets. B. infantis and 3’S1 supplementation did not significantly reduce the incidence or severity of NEC. Analysis of the gut microbiome composition revealed a high abundance of Escherichia-Shigella in healthy piglets while piglets that developed NEC had significantly higher levels of Clostridium sensu stricto 1, which correlated with disease severity, highlighting it as a potential contributor to disease.

Conclusions: Administration of a probiotic and a prebiotic did not provide protection against NEC in a preterm piglet model. Healthy and diseased piglets possess a distinct gut microbiome profile suggesting a noteworthy involvement of the microbiome composition in NEC. Future work is focused on identifying how specific taxa can contribute to NEC incidence and severity.

Images / Graph / Table: No image uploaded