Fecal Elastase in Preterm Infants as a Marker of Pancreatic Function

Lindsay N. Fleig, MD[1], Amy B. Hair, MD[1], Geoffrey A. Preidis, MD, PhD[2], Tripti Halder[2], Heeju Yang[1], Jana Unger, RD[1], Steven D. Freedman, MD, PhD[3,4], Camilia R. Martin, MD, MS[3,4]

[1]Section of Neonatology, Department of Pediatrics, Baylor College of Medicine, Texas Children's Hospital, Houston, TX [2]Section of Gastroenterology, Hepatology & Nutrition, Department of Pediatrics, Baylor College of Medicine, Texas Children's Hospital, Houston, TX [3]Division of Translational Research, Beth Israel Deaconess Medical Center, Boston, MA [4]Department of Neonatology, Beth Israel Deaconess Medical Center, Boston, MA

Background

- Elastase is synthesized in the fetal pancreas starting at 12 wks gestation with first secretion at 20 wks gestation.
- Preterm infants have limited exocrine pancreatic function during the first month of life which may contribute to nutrient malabsorption and growth failure.
- Fecal elastase (FE) is used to determine pancreatic sufficiency (PS) in other patient populations, whether FE can be a potential marker of pancreatic function in the preterm population is unknown.

Objective

To quantify FE longitudinally in preterm infants from initiation of feedings (**Early**) to attainment of full, fortified feedings (**Late**).

Hypotheses

- Preterm infants fed an exclusive human milk diet will show improvement in pancreatic function with ELA1 production in stool over time and with feedings.
- ELA1 can be used as a biomarker for pancreatic function in preterm infants and will positively correlate with improved growth velocity through term post menstrual age.

Limitations

Stool samples were obtained only one day and not multiple days, possibly limiting average of several days.

Methods

- Prospective, pilot study of n=30 preterm infants between 24-34 weeks gestational age (GA) with birth weight (BW) <1250g
- Fecal samples were collected at two time points
- **Early** at feeding initiation, mean sample time 7.5 ± 1.8 days of life (DOL)
- **Late** after obtaining full, fortified feedings, mean sample time was 63.6 ± 24.1 DOL
- FE quantified by ELISA
- Pancreatic insufficiency (PI) is defined as FE levels < 200 ng/mL
- Infants were classified as PS or PI at each time point

Figure 1

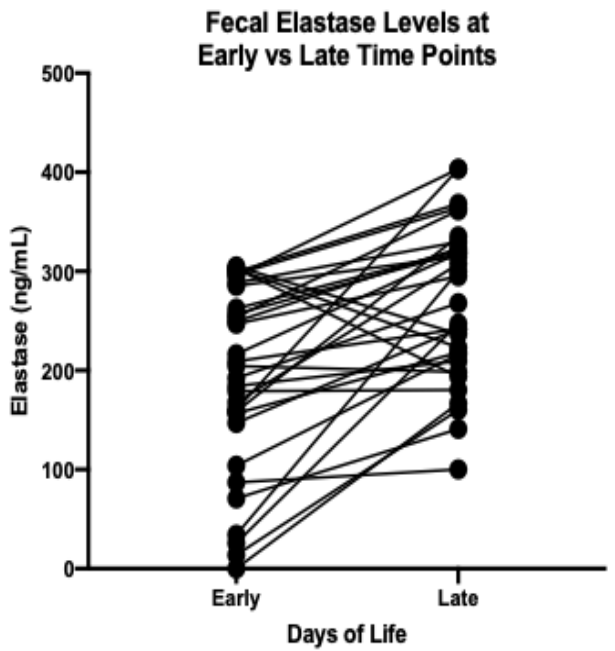

Table 1: Infant Demographics

	PI (N=7)	PS (N=23)	p value
Gestational Age (Weeks)[1]	26.6 ± 1.8	28.3 ± 2.5	0.04
Birth Weight (g)[1]	904 ± 176	1053 ± 169	0.03
Length (cm)[1]	34.2 ± 2.2	36.2 ± 2.2	0.02
Head Circumference (cm)[1]	23.2 ± 1.4	24.9 ± 1.7	0.01
Days to Full Feeds[2]	14 (6.5)	9.5 (2.0)	0.02
Days to Regain Birth Weight[1]	4.5 ± 4.0	5.9 ± 3.7	0.31
Parenteral Nutrition Duration (Days)[2]	15.5 (6.3)	9.0 (2.0)	0.01
Length of Stay (Days)[1]	103.6 ± 28.0	96.0 ± 42.0	0.57
Growth Velocity (g/kg/day)[2]	16.4 (5.1)	19.6 (9.5)	0.25

[1]Mean ± SD, T-Test p-value; [2]Median (IQR), Wilcoxon Rank Sum Test p-value

Table 2: Fecal Elastase Levels at Early versus Late Time Points

	Early (N=30)	Late (N=30)	p value
Fecal Elastase (ng/mL)	192.2 ± 96.4	268.0 ± 80.3	0.01
DOL Sample Obtained	7.5 ± 1.9	63.6 ± 24.1	

[1]Median (IQR), Wilcoxon Rank Sum Test p-value

Results

- Infants with Early PI had a lower GA, lower BW, were shorter, and had a smaller head circumference (**Table 1**).
- *Late FE concentrations were 39.4% higher* compared to Early samples (p=0.01) (**Table 2**).
- Infants with Early PI received parenteral nutrition (PN) 5 days longer (p=0.01) and took 4 days longer to achieve full feedings (p=0.02).
- Growth velocity in Early PI infants was 4g/kg/d lower (p=0.25).

Conclusions

- This pilot data is the first to investigate the impact of the exclusive human milk diet on fecal elastase levels in preterm infants.
- Preterm infants have early, developmental PI that as a population improves over time and with feedings.
- Early pancreatic status is linked to feeding attainment and potentially growth velocity.
- Although this reflects overall immaturity, PI is a biological contributor to the challenges in feeding extremely preterm infants and should be taken into consideration as new feeding options and strategies are proposed for this population.
- Fecal elastase may be a useful early biomarker for pancreatic function and in identifying high risk patients for growth failure and target those most at risk for future interventions.

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