Comparison of Outcomes of Preterm Infants Who Received Human Milk-Based vs. Bovine-Milk Based Human Milk Fortifier

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Abstract

Background: Bovine (BOV) or donor human milk-based fortifier (HUM) is used to add necessary macronutrients to mother's own breastmilk. HUM has been shown to improve growth outcomes and decrease morbidities in infants < 1250 grams (g) birth weight (BW). Data is scant about outcomes for neonates 1250-1500g BW.

Aim: To compare nutritional and clinical parameters of neonates 1250-1500g BW fed HUM vs BOV.

Methods: Data from 150 babies 1250-1500g BW born Jan. 2016-Dec. 2018 were analyzed in this retrospective cohort study. Growth z-scores were calculated using Fenton 2013 curves. Nutrition outcomes included days to full feeds (130 mL/kg/day), parenteral nutrition days, as well as weight, length, and head circumference data. Comparisons were adjusted for BW. Clinical outcomes included common neonatal morbidities.

Results: HUM-fed infants were born earlier, had a lower BW, and higher % of small for gestational age (SGA) infants at birth. Importantly, the postmenstrual age (PMA) at discharge was not significant. HUM-fed infants had a higher weight z-score and growth velocity at discharge.

Conclusions: Despite being more premature and smaller at birth, HUM-fed infants went home at a similar PMA and had less postnatal growth failure compared to BOV infants, demonstrating a HUM diet is associated with improved growth outcomes for infants 1250-1500 g BW.

Background

- Fortifying human milk with human milk-based human milk fortifier (HUM) has been shown to decrease morbidities[1] and improve growth outcomes[2] in infants <1250 grams (g) birth weight (BW).
- It is unclear whether the use of HUM vs. bovine milk-based human milk fortifier (BOV) in human milk fed infants 1250-1500 g BW will show similar outcomes.

Objective

- Compare neonatal outcomes, including clinical and nutritional parameters, of preterm infants 1250-1500g BW fed exclusively human milk fortified with either HUM vs. BOV.

Methods

- Retrospective cohort study including 150 babies 1250 – 1500 g BW born Jan. 2016 - Dec. 2018
- Nutritional z-scores calculated using Fenton 2013 curves [3]
- Statistical testing, including the Wilcoxon signed rank test and the NPAR1WAY procedure, were performed on the following outcomes, which were defined as:
  - Nutritional outcomes: days to full feeds (130 mL/kg/day), days on parenteral nutrition (PN), weight (wt), length (len), head circumference (FOC), PMA, and percentage of SGA infants.
  - Clinical outcomes: rates of necrotizing enterocolitis (NEC), intestinal perforations (IP), patent ductus arteriosus (PDA), retinopathy of prematurity (ROP), grade 3 or 4 intraventricular hemorrhage (IVH), bronchopulmonary dysplasia (BPD)/chronic lung disease (CLD), and late onset sepsis

Results

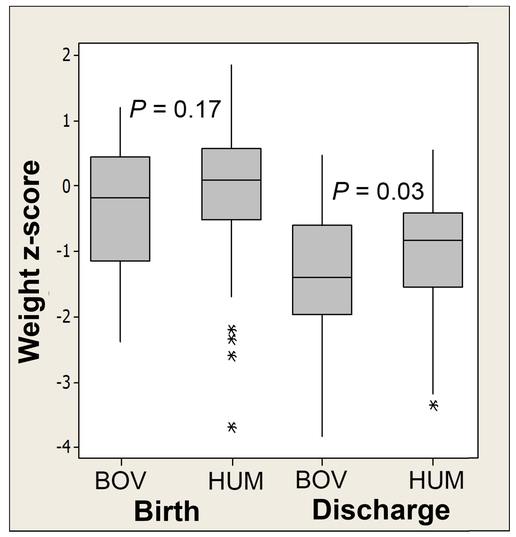
Baseline Characteristics	BOV n = 52	HUM n = 98	*P*-value
Gestational Age Birth (wks)*	31.0 ± 1.8	30.2 ± 1.7	0.005
Birth Weight (g) *	1396 ± 69	1360 ± 74	0.006
Birth Weight Z-Score*	-0.45 ± 1.2	-0.15 ± 0.97	0.17
Birth Length (cm) *	39.4 ± 1.7	39.0 ± 2.4	0.41
Birth Length Z-Score*	-0.30 ± 1.1	-0.30 ± 1.1	0.99
Birth FOC (cm) *	27.5 ± 2.2	27.5 ± 1.4	0.18
Birth FOC Z-Score*	-0.25 ± 1.1	0.05 ± 0.9	0.16
SGA Infants at Birth: n(%)	10(19.2)	6(6.1)	0.023
% Black, % White, % Asian	23.5, 60.8, 25.7	28.1, 63.5, 8.3	0.42
% Hispanic Ethnicity	37.3	23.5	0.09
% Female	40.4	54.1	0.12
% Antenatal Steroids	80.8	88.8	0.22
% Late Onset Sepsis	1.9	6.1	0.42

*Mean ± SD

Clinical Outcomes	BOV n = 52	HUM n = 98	Adjusted *P*-value**
Length of Stay (days)*	46.3 ± 18.6	56.3 ± 24.2	0.031
All NEC: n(%)	0(0.0)	1(2.3)	0.45
IP: n(%)	0(0.0)	1(2.3)	0.45
PDA: n(%)	5(9.3)	4(8.9)	0.85
ROP: n(%)	0(0.0)	1(2.3)	0.45
Grade 3 or 4 IVH: n(%)	2(3.9)	0(0.0)	0.28
BPD/CLD: n(%)	4(8.9)	2(5.1)	0.54
Late Onset Sepsis: n(%)	2(3.7)	2(5.1)	0.79
Days to Full Feeds*	8.6 ± 7.4	8.9 ± 3.8	0.88
Days on PN*	6.7 ± 8.1	7.2 ± 3.9	0.74
PMA at Discharge (wks)*	37.7 ± 2.1	37.9 ± 2.1	0.22
Growth Velocity (g/day)*	21.8 ± 4.0	23.2 ± 3.9	0.03
Discharge Wt Z-Score*	-1.4 ± 0.9	-1.0 ± 0.87	0.03
Discharge Len Z-Score*	-1.14 ± 0.88	-1.0 ± 0.80	0.45
Discharge FOC Z-Score*	-0.87 ± 0.81	-0.64 ± 0.84	0.09
SGA at Discharge: n(%)	25(48.1)	30(30.6)	0.06

*Mean ± SD; **Data adjusted for birth weight

Comparison of BOV and HUM Weight Z-Scores From Birth to Discharge



Discussion

- Days on PN, days to full feeds, and rates of intestinal perforations and NEC were statistically insignificant (*P* = 0.74; *P* = 0.88; *P* = 0.45; *P* = 0.45), indicating that both BOV and HUM fortifiers were tolerated equally well by infants. This suggests that areas of statistical significance could be attributed to the efficacy of these fortifiers in adding calories, proteins, lipids, and carbohydrates that are more readily absorbed by the infant gut.
- An increased absorption of macronutrients in the HUM group could cause the observed increase in growth velocity. In turn, this could explain the HUM group's significantly greater weight discharge z-score.

Conclusions

- Despite being more premature and smaller at birth, HUM fed infants had less postnatal growth failure and went home at a similar PMA as BOV infants.
- This study suggests that the use of HUM vs. BOV in human milk fed premature infants with a birth weight of 1250-1500 g may be associated with improved growth.
- In the future, we plan to assess the long-term growth and neurodevelopmental outcomes of these infants.

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References

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