September 20th, 2023 15:00 - 17:00

PARALLEL SESSION 10 - NUTRITION 2

ID 405. Gut microbiota in preterm infants fed human milk fortified with bovine colostrum

Miss Lin Yang[1], Mr Yan Hui[2], Professor Per T. Sangild[1], Associate Professor Lise Aunsholt[3], Professor Gitte Zachariassen[4], Associate Professor Ping-ping Jiang[1], Professor Dennis S. Nielsen[2]

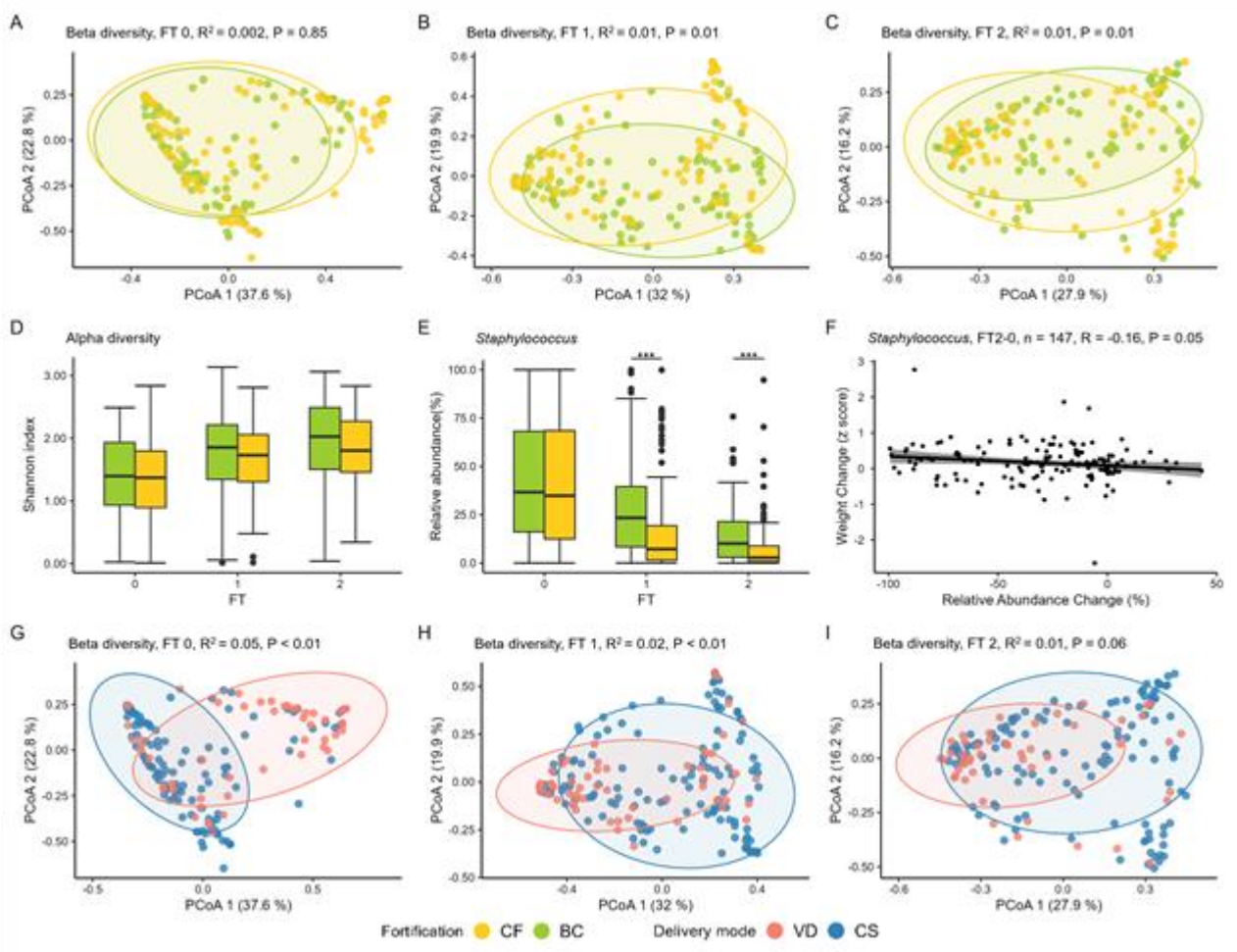
[1]Department of Veterinary and Animal Sciences, University Of Copenhagen, Copenhagen, Denmark, [2]Department of Food Science, University Of Copenhagen, Copenhagen, Denmark, [3]Department of Neonatology, Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark, [4]Department of Paediatrics, Hans Christian Andersen Children's Hospital, Odense University Hospital, Odense, Denmark

Background: Fortification of human milk is required for proper growth of very preterm infants (VPIs). In a recent trial, fortification of human milk with bovine colostrum (BC) was shown to induce growth of VPIs similar to a conventional fortifier (Clin. Nutr. 42, 773–783, 2023). Effects of diet on growth depend on nutrient intake, interacting with factors such as the gut microbiota (GM). We hypothesized that faecal microbiota composition in VPIs is affected by type and amount of fortifiers and is associated with growth outcomes.

Methods: Faecal samples were collected from VPIs (n = 225) enrolled in the trial before (time point 0, FT0), 1 (FT1) and 2 (FT2) weeks after the start of fortification with BC or a conventional fortifier (CF, PreNan FM85, Nestlé). The microbiota was profiled by 16S rRNA gene amplicon sequencing. Microbial species diversity (alpha

diversity), microbial community structure (beta diversity) and taxa abundance were studied in relation to fortification group, birth mode and body growth.
Results: At both FT1 and FT2, infants receiving BC showed altered gut microbial community structure (beta diversity) and higher abundance of staphylococci (Wilcoxon, $p<0.05$) but no differences in species diversity (alpha diversity) was observed between BC and CF groups. Across fortification groups, the change in abundance of staphylococci from FT0 to FT2 tended to negatively correlate with body weight change (change of Z–scores referenced to Fenton's growth chart) in the same period ($p=0.05$, $R=-0.16$). Caesarean–delivered infants had a different gut microbial community structure from infants born vaginally only over the period FT0 to FT1 ($p<0.05$), the gut with microbiota dominated by Firmicutes whilst vaginally–delivered infants by Proteobacteria.

Conclusion: BC fortification induced modest, but significant effects on the developing gut microbiota in VPIs, relative to CF. Increased abundance of staphylococci over time tended to correlates negatively with body growth. Birth mode affects GM only shortly after birth.



Change of the gut microbiota in very preterm infants related to fortification, birth mode and growth.

Change of the gut microbiota in very preterm infants related to fortification, birth mode and growth.

The University of Copenhagen (Per T. Sangild) holds a patent on the use of colostrum for preterm infants.

ID 300. NORMAL VALUES FOR VENOUS, ARTERIAL, AND CAPILLARY POTASSIUM – STATEMENTS ON THE DISPENSABILITY OF CONTROLS THROUGH EVALUATION OF 166,604 BLOOD GAS ANALYSES

Doctor Rudolf Ascherl[1], Doctor Benjamin Ackermann[1], Professor Matthias Knuepfer[1]
[1]University Of Leipzig, Leipzig, Germany

Background.
In neonatal intensive care units (NICU), potassium is frequently determined in blood gas analyses (BGA). If it does not fall within classical normal values, controls are ordered because complications of hyperkalemia are feared. Separate references for capillary, venous, and arterial samples are lacking.

Methods.
From over 200,000 patient days of electronic patient records 166,604 BGA were extracted and annotated with gestational age (GA), day of life (DOL), and weight at the time of sampling, diuretic administration up to 4h, and potassium substitution up to 24h before sampling. As a surrogate for impaired general condition (GC), we considered administration of certain medications (inotropes, buffers, doxapram, etc.) up to 12h, FiO_2>0.4 up to 1h, urine production <0.5 ml/kg/h up to 24h, and central–peripheral temperature difference >2°C up to 4h before sampling. Values are median [P2.5;P97.5].

Results. Annotation was successful in 97.8% of the BGAs. Of these, 99.8% had credible potassium (1.5 to 10mM). Hence, 162,722 values from 8,994 patients (GA 36.3 [25.6;41.4] weeks, 55.2% male, 9 [1;107] BGA/patient) are considered. Arterial samples were 11%, venous 21%, and capillary 68%; samples were taken on the 7th [1–104] DOL; weight was 2.08 [0.66;4.41] kg. In a multivariate model, diuretics, DOL,

GC, and postmenstrual age — unlike weight and potassium substitution — were significant. Distributions of all values after excluding samples taken under impaired GC and diuretics are presented in the table. Comparing capillary samples with values from other sites within ±2h (n=4635), showed a difference of 0.7 [–1.0;3.6] mM ($p < 0.00001$). This difference is smaller under the interval [3.5;6.1] formulated here than above it (0 [–1.6;0.9] vs. 2.4 [0;5.1] mM, $p < 0.00001$).

Conclusion.

This is the most extensive analysis of BGAs in NICU patients to date. We recommend new thresholds for capillary potassium: 3.5 to 6.1mM. Potassium is 0.7mM higher in capillary samples than in other sites; this difference is greater in hyperkalemia. To avoid overdiagnosis, we suggest very restrictive control of capillary potassium under 6.1mM in a stable clinical situation. Incorporating these recommendations into routine practice can prevent many unnecessary and painful blood draws.

	all ages		after 14th day of life	
sample site	n	K^+ [mM]	n	K^+ [mM]
capillary	38863	4.4 [3;6.5]	13371	4.3 [3;6.1]
arterial	2585	3.7 [2.8;5.3]	112	4.1 [2.6;5.7]
venous	8019	3.7 [2.5;5.4]	1495	3.9 [2.6;5.5]

Potassium values from all blood gas analyses in our neonatal intensive care unit after exclusion of samples drawn during impaired general condition and diuretics. Values are median [P2.5;P97.5].

Potassium values from all blood gas analyses in our neonatal intensive care unit after exclusion of samples drawn during impaired general condition and diuretics. Values are median [P2.5;P97.5].

None declared

ID 461. Fecal metabolome in preterm infants fed human milk fortified with bovine colostrum

Doctor Yongxin Ye[1,2], Professor Pingping Jiang[1], Professor Per Torp Sangild[1,3,4], Professor Lise Aunsholt[1,3], Professor Gitte Zachariassen[4], Professor Stine Brandt Bering[1], Professor Bekzod Khakimov[2]

[1]Section for Comparative Paediatrics and Nutrition, Department of Veterinary and Animal Sciences, University of Copenhagen, Copenhagen, Denmark, [2]Department of Food Science, University of Copenhagen, Copenhagen, Denmark, [3]Department of Neonatology, Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark, [4]Department of Paediatrics, Odense University Hospital, and University of Southern Denmark, Odense C, Denmark

Background: Very preterm infants (VPIs) fed human milk require supplementation with nutrient fortifiers to achieve sufficient growth. Fortifiers composed of processed bovine milk (formula) products, lacking raw milk bioactivity, are suspected to induce inflammation and increase the risk of necrotizing enterocolitis. We hypothesized that bovine colostrum (BC), used as a fortifier to human milk, stimulates the gut microbiome of VPIs differently than a conventional fortifier (CF, PreNan FM85, Nestlé), thus inducing a characteristic “healthier” fecal metabolome that correlates to growth.

Methods: Fecal samples were collected from VPIs before fortification (time point 0: FT0, 1–2 weeks of age, 100–140 mL/kg/d human milk) and 1 (FT1) or 2 (FT2) weeks after fortification with BC (n=107) or CF (n=112) in a randomized, controlled trial across eight Danish hospitals (Clin. Nutr. 42:773–83, 2023). The fecal metabolome was measured by proton nuclear magnetic resonance (1H NMR) spectroscopy. Metabolites were analyzed according to fortification group, gestational age (GA),

small for gestational age (SGA or not), delivery mode (DM), postnatal age (PA), use of antibiotics or probiotics (with false discovery rate correction).

Results: The main factors that affected fecal metabolome were fortification type and use of antibiotics. At both FT1 and FT2, fecal metabolites potentially important for growth (choline, creatine, creatinine, succinate) and essential amino acids (lysine, phenylalanine, tryptophan) were higher in BC infants relative to CF infants (all $p<0.05$). Antibiotic use reduced the levels of short–chain fatty acids but favored formation of secondary bile acids (especially at F1). At both time points, levels of acetoin and choline were higher in infants exposed to probiotics.

Conclusion: The novel BC fortifier markedly affected the fecal metabolome of VPIs. Metabolite effects may result from fortifier–related differences in dietary protein (e.g., intact vs. hydrolyzed/modified proteins) or carbohydrate (lactose vs. maltodextrin), and associated changes to the gut microbiome. The possible consequences related to clinical outcomes (e.g., growth, feeding intolerance, sepsis, NEC) are currently being investigated.

None declared

ID 907. EARLY HUMAN MILK FORTIFICATION IN PRETERM INFANTS BORN AT 28 WEEKS OF GESTATION OR LESS: A MASKED RANDOMIZED TRIAL

Doctor Ariel Alejandro Salas[1], Doctor Emily Gunawan[1], Miss Kelly Nguyen[1], Mrs. Audrey Reeves[1], Mrs. Victoria Argent[1], Mrs. Amber Finck[1], Doctor Wally Carlo[1]

[1]University of Alabama at Birmingham, Birmingham, United States

Background

The use of unfortified human milk for enteral nutrition during the first two weeks after birth often results in protein and energy deficits among preterm infants. To address this issue, the administration of fortified human milk soon after birth has been explored as a potential solution, with the aim of improving growth and increasing fat–free mass (FFM) accretion in these infants.

Methods

We conducted a masked, randomized trial involving extremely preterm infants born at 28 weeks or less. The infants, who were fed either maternal or donor milk, were randomly assigned to two groups: one receiving a diet fortified with a human–based product (intervention group) and the other receiving a standard, unfortified diet (control group). This practice continued until the feeding day when a standard bovine–based fortifier was ordered (around postnatal day 14). The caregivers were blinded to the group assignments. The primary outcome was fat–free mass (FFM)–for–age z score at 36 weeks of postmenstrual age (PMA).

Results

Between 2020 and 2022, a total of 150 infants were enrolled and randomized. The mean birth weight was 795 ± 250 g, and the median gestational age was 26 weeks.

Eleven infants died during the observation period. The primary outcome was assessed in 105 infants. The FFM–for–age z scores did not show significant differences between the intervention and control groups (–1.7 vs –1.6, respectively). However, the intervention group exhibited higher length gain velocities in cm/week from birth to 36 weeks PMA (p=0.04), and the decline in head circumference–for–age z scores from birth to 36 weeks PMA was less pronounced in this group (–0.9 vs –1.3; p=0.01).

Conclusions

In extremely preterm infants, fortifying human milk diets soon after birth does not lead to increased FFM accretion at 36 weeks PMA. However, it may contribute to higher length gain velocities and reduced declines in head circumference–for–age z scores.

The authors have no conflicts of interest relevant to this article to disclose. Dr. Salas patented an instrumented feeding bottle and received consulting fees for participation in advisory board meetings.