ID: 146  
TITLE: FAT LOSS IN CONTINUOUS TUBE FEEDING  
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CONTENT:  
Extrauterine growth restriction is common among preterm and extremely low birth weight infants and poor postnatal growth is associated with impaired neurodevelopment. Hence, to optimize neonatal nutrition is crucial. Continuous tube feeding has shown to lead to better growth and faster full enteral feeding. However, it is well known that continuous tube feeding results in lipid loss. We hypothesized that by placing the pump lower than the infant it would be possible to reduce lipid loss. Our objective is to investigate the effect of enteral syringe pump placement on fat loss during continuous and bolus tube feeding of breast milk to preterm infants.  

An experimental study where 81 feeding simulations were performed; with nine continuous infusions in each of six modalities: Horizontal Higher, Horizontal Matched, Horizontal Lower, Tilted Higher, Tilted Matched and Tilted Lower, and 27 bolus feedings: nine flushed with air, nine with water and nine that were not flushed (fig. 1). Each simulation utilized 16 mL of breast milk given over four hours. Continuous infusions were given with a flow rate of 4 mL/h. Bolus was given as 8 mL over the course of 15-20 minutes every other hour. Analysis for fat, crude and true protein, carbohydrate, total solids and energy, was performed before and after each simulation using Miris Human Milk Analyzer, Miris HMA™ Uppsala, Sweden. The percent of macronutrient loss was compared between all simulations.  

An average fat loss of 40% occurred when using the continuous feeding method and the fat loss was not reduced by tilting the pump or by placing the pump higher or lower than the infant. Meanwhile, the bolus feeding method only resulted in an average fat loss of 11% (Table 4). Further, an average energy loss of 14% occurred during continuous feedings compared to 5% during bolus feedings (Table 4). For the results of all the feeding simulations see Table 1.  

Considerable fat loss is seen during continuous tube feeding. Neither height in relation to the infant or tilting of the pump can reduce fat loss. The best way to reduce fat loss is to use the bolus feeding method.  

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COI: Mattias Paulsson has received honoraria for teaching assignments from the following pharmaceutical companies: Fresenius Kabi, B Braun and Baxter Medical. No other authors have conflicts of interest to disclose.
ID: 239

**TITLE:** ADVERSE EFFECTS OF COW’S MILK-BASED FORTIFIER (CMDF) OCCUR DESPITE USE OF A 100% HUMAN MILK BASE DIET: A META-ANALYSIS

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**CONTENT:**

Cow’s milk (CM) based nutritional products may have diverse adverse effects in very low birthweight (VLBW) preterm infants. Hence a current recommendation, when mother’s own milk (MOM) supply is insufficient, is to use donor breast milk (DBM) rather than preterm formula to provide 100% HM base diet, which is then fortified, most commonly using CM derived fortifier (CMDF). Despite the increasing and widespread prevalence of this practice, the safety of using a CMDF in this circumstance has received very little scientific attention. Therefore, we tested for any major morbidities associated with this use of CMDF, versus a comparison group fed HM derived fortifier (HMDF).

Only one randomised trial (RCT) has compared CMDF with HMDF in VLBW infants fed 100% HM base diet (OptiMoM, 2018). We identified two further studies where the same comparison was possible after reanalysis of raw data: (1) the original RCT of Sullivan et al (2010) compared HM plus CM based products (fortifier and preterm formula) vs HM + HM based products. A subgroup analysis of 114 babies with 100% MOM base diet allowed comparison of CMDF and HMDF; (2) 2 of 4 groups in the quasi-experimental study of Assad (2014) were reanalysed (n=214) to compare CMDF pre-2012 and HMDF post-2012; all fed 100% HM base diet. These 3 studies were analysed individually for major morbidities associated with fortifier type and then the data were combined using meta-analyses with a fixed effect model.

OptiMoM RCT was only powered to examine feed tolerance yet our own analysis showed higher total morbidity events/case in the CMDF v HMDF group based on necrotizing enterocolitis (NEC); retinopathy of prematurity (ROP), broncho-pulmonary dysplasia (BPD), sepsis, and death (0.74 v 0.48 adverse events/case; P=0.03). Relative risk (RR) of severe ROP alone was 6.4 in the CMDF v HMDF group (P=0.04). The Sullivan RCT subgroup reanalysis had well matched groups for baseline demographic factors; the CMDF group had higher risk of NEC (Bell’s stage II+) (RR=4.2; P=0.04); and NEC surgery or death (RR=5.1; P=0.01; number needed to harm = 7). The Assad reanalysis showed significant adverse effects of CM versus HM derived fortifier for NEC (RR 7.5; P=0.02), ROP (RR 2.5; P= 0.001), PDA (RR 2.7; P=0.007) and feeds withheld >24h (RR 5.9; P=0.001). Results of meta-analyses are summarised in the table.

Even with 100% base diet of MOM and/or DBM, use of a CMDF was associated with major morbidities versus a comparison group fed a HMDF. These morbidities include NEC, NEC surgery or death, severe ROP, PDA, feed intolerance and total adverse events (NEC, ROP, sepsis, BPD and death). Such safety data are now needed for newer hydrolysed CM derived fortifiers. Our findings have significant implications for neonatal nutrition.

**IMAGES:**
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Meta-analyses for outcomes in relation to fortifier type
COI: Dr. Lucas is a scientific advisor for Prolacta, Inc. Dr. Abrams is a member of the scientific advisory board of MilkPep, the education program of the Milk Processor Education Program.
ID: 740

TITLE: EXPOSURE TO HUMAN MILK-OLIGOSACCHARIDES IN THE FETAL PERIOD BY AMNIOTIC FLUID

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CONTENT:

Amniotic fluid (AF) is the first fluid to enter the gastrointestinal tract. Human milk oligosaccharides (HMOs) are complex carbohydrates that are found abundantly in human milk. Accumulating more evidence demonstrates that HMOs are both human milk prebiotics to help beneficial microbes as metabolic substrates and are also antimicrobials with direct bacteriostatic or bactericidal properties or antiadhesives which block the attachment of potentially pathogenic microbes. Although HMOs in breast milk have been adequately studied, there has been any data on the presence of lactose and HMOs in the amniotic fluid. The aim of our study was to evaluate if the amniotic fluid contains lactose and HMOs.

Amniotic fluid samples from 50 mothers (median (IQR) gestational age, 38.1 weeks (36.4-38.9)) were collected during delivery via caesarean section. The samples were analyzed in the laboratory of Jennewein Biotechnologie GmbH (Rheinbreitbach, Germany) using high performance anion exchange chromatography with pulsed amperometric detection (HPAEC-PAD) or liquid chromatography coupled with mass spectrometry (LC / MSMS) for lactose and 7 HMOs (N-acetylgalactosamine acid (Neu5Ac), 3-sialyl lactose (3'-SL), 6'-Sialyllactose (6'-SL), N-acetylgalactosamine (GlcNAc), 2'-fucosyllactose (2'-FL), 3-fucosyl lactose (3'-FL), and lacto-N-tetraose (LNT)).

In all amniotic fluid samples, we were able to identify Neu5Ac and 3'-SL concentrations: The median (IQR) concentration of Neu5Ac: 0.334 μg/ml (0.275-0.365) (min-max: 0.199-0.489 μg/ml) and 3'-SL: 2.177 μg / ml (1.845-2.574) (min-max: 0.929-4.082 μg/ml). The other HMOs, 6'-SL, GlcNAc and LNT, were identified in none of the amniotic fluid samples. Although 2'- FL and 3'-FL were identified in four samples, we have not yet evaluated these results because of the small number of samples. The median (IQR) concentration of lactose was 5,185 μg/ml (4.259-7.990) (min-max: 1.659-30.108). There was a statistically significant positive correlation between the concentration of Neu5Ac and 3'-SL in the amniotic fluid (correlation coefficient according to Pearson, r = 0.769, p <0.001). The concentration of lactose was not correlated with the concentration of Neu5Ac or 3'-SL.

We were able to show that the amniotic fluid, as well as breastmilk, contains lactose and at least two HMOs N-acetylgalactosamine and 3'-sialyl lactose. These new findings provide clear evidence that a fetus is already exposed to at least some HMOs during the fetal period. Further experimental studies must be performed to understand the physiological significance of HMOs in amniotic fluid.

COI: No
ID: 955
TITLE: IMPACT OF MATERNAL STRESS ON MACRO-NUTRIENT CONTENTS OF MATERNAL BREAST MILK EXPRESSED FOR PRETERM INFANTS
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CONTENT:

Breast milk is the recommended nutrition for all infants within first 6 months, as per WHO (World Health Organisation). It is a dynamic substrate and is quite variable in its composition. It shows inter-personal, inter-day and intra-day variability in nutrients and energy makeup. Various maternal socioeconomic and dietary factors have been implicated as potential modulators of maternal expressed breast milk (MEBM) composition. Reduction of psychological stress and anxiety has been linked with improved lactation, however, effect of maternal stress on macro-nutrient composition of MEBM is not yet established.

AIM: To study the impact of various levels of stress on macro-nutrient content of breast milk expressed for preterm infants.

Methods: This was a prospective cohort study of mothers and their infants born <32 weeks and/or <1500g, recruited two to three weeks postpartum. Maternal and infant baseline data including socio-economic and psychological factors were recorded via questionnaires. Stress was assessed via 1-5 severity rating question and perceived stress score (PSS) scale. 24-hour pooled expressed breast milk sample was analysed weekly, using MIRIS Breast Milk Analyser®. Statistical analysis was performed using IBM SPSS® 25 software. Linear regression on each macronutrient and multivariate analysis on maternal stress adjusted for maternal BMI and daily hours of sleep was performed.

Total no of mothers participated were 50, but 39 had paired data available for analysis. Mean age of mothers was 35(SD±4.9) years and BMI was > 25kg/ m2 in 46%. Mothers with high stress levels had marginally decreased protein in MEBM, in the first few weeks after delivery (1.16 vs 1g /dl), fat appeared slightly lower throughout however calories and carbohydrates were shown to be higher (Table 1) on protein showed significant negative correlation to stress score (p < 0.05). Multivariate analysis. of maternal stress scores adjusted for maternal BMI and current duration of sleep per day (hours), did not show any effect on any other macro-nutrients and caloric composition of MEBM

MEBM protein is decreased in mothers who experience high levels of psychological stress. This may have implication in postnatal infant growth. However, caloric contents of MEBM seems to be unrelated to stress. Observed variability in carbohydrates is potentially a reflection stress related hormonal effect in mothers. Our study suggests that maternal milk composition can be improved by intervening to reduce maternal stress.

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Table 1

COI: none declared