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ORIGINAL ARTICLE

Serum phenylalanine in preterm newborns fed different diets of human milk☆,☆☆

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KEYWORDS
Serum phenylalanine;
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Abstract
Objective: To evaluate phenylalanine plasma profile in preterm newborns fed different human milk diets.
Methods: Twenty-four very-low weight preterm newborns were distributed randomly in three groups with different feeding types: Group I: banked human milk plus 5% commercial fortifier with bovine protein, Group II: banked human milk plus evaporated fortifier derived from modified human milk, Group III: banked human milk plus lyophilized fortifier derived from modified human milk. The newborns received the group diet when full diet was attained at 15 ± 2 days. Plasma amino acid analysis was performedon the first and last day of feeding. Comparison among groups was performed by statistical tests: one way ANOVA with Tukey's post-test using SPSS software, version 20.0 (IBM Corp, NY, USA), considering a significance level of 5%.
Results: Phenylalanine levels in the first and second analysis were, respectively, in Group I: 11.9 ± 1.22 and 29.72 ± 0.73; in Group II: 11.72 ± 1.04 and 13.44 ± 0.61; and in Group III: 11.3 ± 1.18 and 15.42 ± 0.83 μmol/L.
Conclusion: The observed results demonstrated that human milk with fortifiers derived from human milk acted as a good substratum for preterm infant feeding both in the evaporated or the lyophilized form, without significant increases in plasma phenylalanine levels in comparison to human milk with commercial fortifier.

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PALAVRAS-CHAVE
Fenilalanina plasmática;
Leite humano;
Aditivo para leite humano;
Leite humano de banco;
Recém-nascido pré-termo

Fenilalanina plasmática em recém-nascidos pré-termo alimentados com diferentes dietas de leite humano

Resumo
Objetivo: Avaliar o perfil plasmático do aminoácido fenilalanina em recém-nascidos pré-termo alimentados com diferentes dietas de leite humano.
Métodos: Foram estudados 24 recém-nascidos pré-termo de muito baixo peso, distribuídos em três grupos com diferentes dietas: Grupo I: leite humano de banco com 5% de aditivo comercial para leite humano com proteína de origem bovina (LHB-AC); Grupo II: leite humano de banco com aditivo de leite humano modificado evaporado (LHB-E); e Grupo III: leite humano de banco com aditivo de leite humano modificado liofilizado (LHB-L). Os recém-nascidos receberam a dieta definida para o grupo quando alcançaram dieta plena por 15±2 dias. A análise do aminoácido plasmático foi feita no primeiro e último dias da dieta. A comparação entre os grupos foi realizada por meio do teste ANOVA de uma via, seguido pelo pós-teste de Tukey, utilizando-se o software SPSS, versão 20.0 (IBM Corp, NY, EUA), e considerando um nível de significância de 5%.
Resultados: As concentrações plasmáticas do aminoácido fenilalanina na primeira e segunda análises foram, respectivamente, no Grupo I (LHB-AC) 11,9±1,22 e 29,72±0,73; no Grupo II (LHB-E) 11,72±1,04 e 13,44±0,61; e no Grupo III 11,3±1,18 e 15,42±0,83 umol/L.
Conclusão: Os resultados encontrados demonstram que o leite humano com aditivos do próprio leite humano comportou-se como um bom substrato para alimentação do recém-nascido pré-termo, tanto na forma evaporada como liofilizada, sem levar a aumentos significativos na concentração plasmática de fenilalanina em comparação ao leite humano com aditivo comercial.

Introduction

The superiority of human milk (HM) feeding in preterm newborns (PNs) is well documented. HM has an important impact on brain growth and development, even when it does not promote great weight gain, supporting the concept that the optimal postnatal growth of PNs is not yet known.[1–5]

Regarding the supply of proteins, not only the quantity but also the quality is important for proper growth. The amino acid composition of formulas and additives to human milk using bovine protein has reduced quality in relation to HM,[6–9] which is considered the gold standard.

The protein fraction of cow's milk has a predominance of casein, which has high content of the amino acid phenylalanine.[10] Although it is an essential amino acid in children receiving cow's milk protein, plasma levels of this amino acid are high (close to those associated with metabolism defects).[11–13]

The increased intake and plasma levels of phenylalanine results in the inhibition of the enzyme tyrosinase, and subsequent conversion, through hydroxylation, of phenylalanine into tyrosine, increasing tyrosine availability. This increase can cause a deleterious effect on brain development, leading to consequences such as sleep disturbance, memory deficits, and attention and concentration deficits.[14–17]

While the optimal nutrition for PNs is unknown, neonatologists should be committed to what appears to be ideal, which does not result in changes in the short-term, and provides better long-term development. In this context, supplementing HM with an additive containing a protein homologous to that of HM appears to be a suitable alternative for protein supply, while maintaining safe plasma levels of phenylalanine.[18–20]

Considering this hypothesis, this study aimed to comparatively analyze plasma levels of phenylalanine in PNs fed banked human milk (BHM) plus the commercial additive FM85 (Fortified Milk 85, Nestlé, São Paulo, Brazil) and PNs fed with BHM plus an additive derived from the HM itself, after removal of fat and lactose in evaporated or lyophilized forms.

Methods

After approval of the Federal University of Mato Grosso do Sul (UFMS) Research Ethics Committee (Res. 17/2006), a non-blinded randomized clinical trial was performed from 2008 to 2010, in the neonatology section of the Núcleo do Hospital Universitário (NHU) of UFMS (Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, Brazil).

A total of 24 PNs hospitalized in the neonatal sector, of both genders, were studied after being divided into three groups. Each group received a different HM-based diet. The groups were compared for plasma levels of phenylalanine. To confirm that the groups had similar characteristics and that the difference in plasma phenylalanine levels was associated with the diet they received, the PNs were compared regarding gender, gestational weight/age, respiratory distress syndrome (RDS), gestational age, birth weight, start of feeding, volume, calories, early minimal enteral nutrition, and days on ventilator.

The diets offered to each group were: