



Lower calcium absorption in infants fed casein hydrolysate- and soy protein-based infant formulas containing palm olein versus formulas without palm olein

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Introduction

During the first year of life an infant's birth weight triples and length increases by 50%. To meet the requirements of their rapidly expanding skeletal mass, growing infants require a bioavailable source of calcium.

Palm olein oil is a fat source often used in infant formula. It is included in order to supply palmitic acid at higher levels like those in human milk. However, the palmitic acid in human milk differs at a molecular level from that provided by vegetable oils. Palmitic acid from vegetable oils is less well absorbed and consequently reduces the absorption of calcium in cow milk-based formulas due to formation of calcium soaps.¹

Palm olein oil is one potential fat source in infant formula. It is often included to mimic the levels of palmitic acid found in breast milk but is not as well absorbed by infants compared to other oils.

Study Purpose

This study extends the prior research on the effect of palm olein on calcium absorption in cow milk-based formulas to examine the effect of palm olein on nutrient absorption in casein hydrolysate- and soy protein-based formulas.

Study Design

Two separate studies were conducted with normal term infants. Both studies were controlled, randomized, masked, crossover design, three-day balance studies. The first study (n=10) randomly assigned infants to receive commercially-available casein hydrolysate-based formula with or without added palm olein. The second study (n=12) randomly assigned infants to receive commercially available soy protein-based formula with or without added palm olein. Fat and calcium absorption were determined based on: weight of formula intake, weight of stools, and measured calcium and fat in formula and stools.

All formulas fed in this study were commercially available ready-to-serve infant formulas. The two formulas with added palm olein were *Nutramigen* (casein hydrolysate-based) and *ProSobee* (soy-based) [Mead Johnson Nutritionals, Evansville, Indiana] and the formulas without added palm olein were *Alimentum* (casein hydrolysate-based) and *Isomil* (soy-based) [Abbott Nutrition, Columbus, Ohio].

Study Results

Fat and calcium *intake* did not differ between the 2 soy-based formulas and the 2 casein hydrolysate-based formulas. However, in the casein hydrolysate study, the infants fed the formula with added palm olein absorbed significantly less fat and calcium ($P<0.01$) as compared to the casein hydrolysate formula without added palm olein, 41% and 92% compared to 66% and 97% for calcium and fat absorption, respectively.

For infants fed the soy-based formula, mean calcium absorption was also significantly less for the infants fed the formula with the added palm olein as compared to the soy-based formula without added palm olein ($P<0.05$), 22 and 37% respectively. Fat absorption did not differ between the two soy-based formulas.

Discussion

This study adds to the growing body of evidence that suggests using palm or palm olein in infant formulas at levels needed to match the palmitic acid content in human milk can significantly reduce calcium absorption. Designing infant formula based on human milk composition rather than clinical performance may create outcomes with unintended physiologic consequences.

In addition to the impact on calcium and fat absorption, the digestion characteristics of palm olein by infants can have physiological consequences. Among these are reports of an increase in hard stools linked to the creation of calcium soaps,^{2,3} and, more importantly, reports that suggest a reduction in bone mineral accretion.⁴⁻⁶

Study Conclusions

- Infants fed formula (either casein hydrolysate- or soy protein-based) containing a significant part of the fat as palm olein absorbed significantly less calcium than infants fed formula that did not contain palm olein.
- Infants fed casein hydrolysate-based formula containing a significant part of the fat as palm olein absorbed significantly less fat than infants fed palm olein free casein hydrolysate-based formula.

Key Finding:

Infants fed either palm olein-containing casein hydrolysate- or soy protein-based formula absorbed less calcium than those fed palm olein free formula.

References

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