

BACKGROUND

Infants fed human milk typically have greater blood and tissue carotenoid concentrations than infants fed formula, even when formula carotenoid content is matched to that of human milk. This suggests that carotenoids from human milk are better absorbed than from formula, but absorption differences have not been explained by differences in physical attributes.

PURPOSE

To test the hypothesis that expression of genes implicated in carotenoid and metabolism differs in the small intestinal tissue of donor human milk (DHM)- vs. formula fed-piglets.

METHODS

- Preterm piglets were fed either pasteurized DHM (Prolacta, n=7) or premature infant formula (Enfamil Premature) (n=7) from 2 to 7 days of age
- Healthy jejunal mRNA expression of scavenger receptor class B member 1 (*Scarb1*), low-density lipoprotein receptor (*Ldlr*), 3 ATP binding cassette transporters (*Abca1*, *Abcb1*, *Abcg2*, *Abcg5*, *Abcg8*), beta-carotene oxygenase 1 (*Bco1*), cluster determinant 36 (*Cd36*), intestine specific homeobox (*Isx*), and beta-carotene oxygenase 2 (*Bco2*), and Niemann-Pick C 1 Like 1 (*Npc1l1*) analyzed by qRT-PCR using pre-validated porcine Taqman expression assays
- The target gene relative expression was normalized to ribosomal protein L4 (*Rpl4*) (dCt method) and formula-fed piglet expression was analyzed relative to DHM-fed piglets (ddCt method).
- Group differences were determined by one-way ANOVA (alpha=0.05).

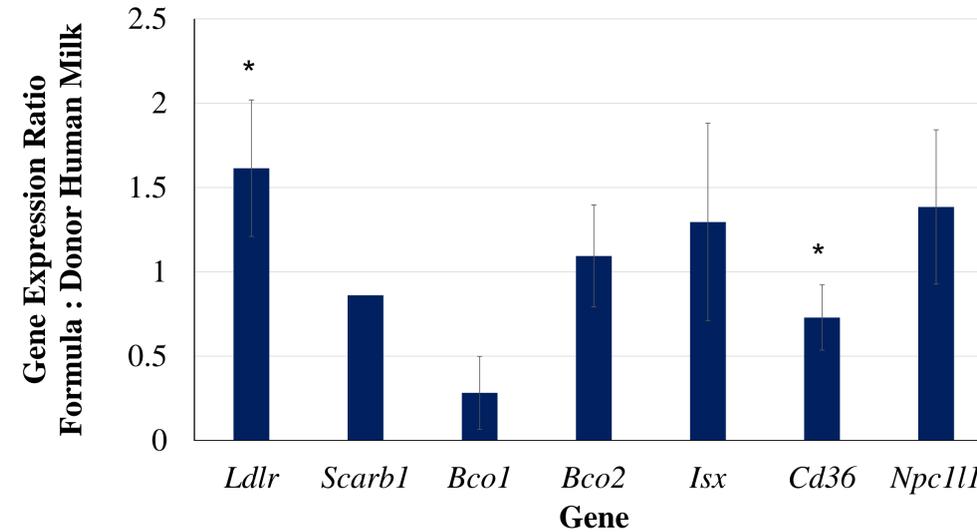


Figure 1: Jejunal expression of genes known to be involved in intestinal carotenoid absorption and metabolism in formula-fed piglets relative to DHM-fed piglets.

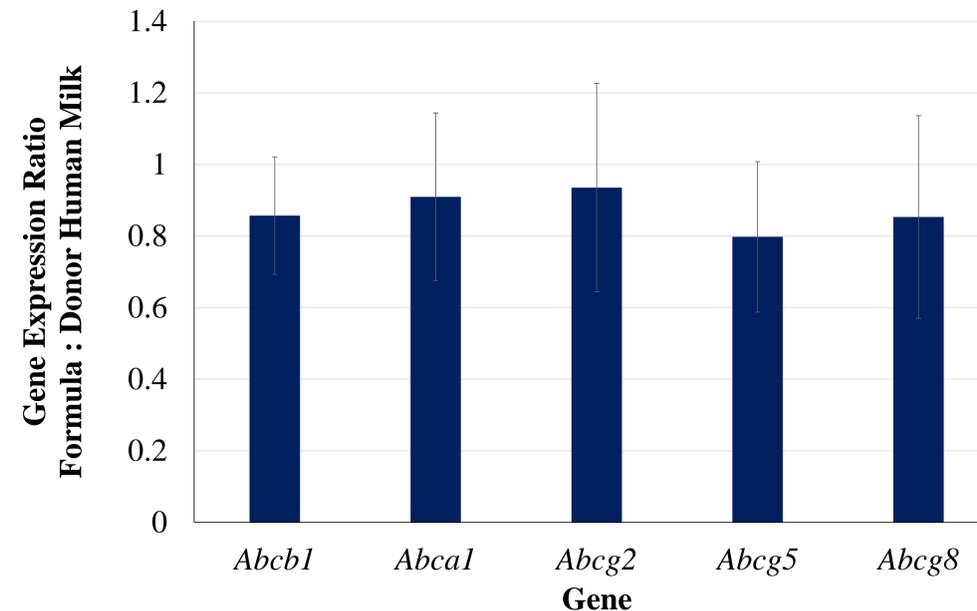


Figure 2: Jejunal expression of genes putatively involved in intestinal carotenoid absorption and metabolism in formula-fed piglets relative to DHM-fed piglets.

RESULTS

- Expression of all 12 target genes was detectable.
- Expression of *Ldlr* was greater in formula-fed piglets (1.57±0.39-fold, $P=0.018$).
- Expression of *Cd36* was lower with formula feeding (0.747±0.20-fold, $P=0.034$) than DHM-feeding.
- Expression of the other genes did not significantly differ by diet treatments.

CONCLUSION

- Expression of *Cd36* and *Ldlr* differ by DHM- vs. formula-feeding after only 5 days
- *Cd36* mediates apical absorption of beta-carotene, and therefore the lower expression in the formula-fed piglets may provide an explanation by which carotenoid absorption is lower in formula-fed versus DHM-fed infants
- *Ldlr* plays a role in cholesterol homeostasis, and expression changes may indicate a shift in intestinal lipid metabolism resulting from different cholesterol contents of DHM vs. formula
- Future studies should examine the effects of HDM vs. formula on piglet carotenoid absorption, serum carotenoid concentrations, and gene expression at different intestinal locations

FUNDING

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