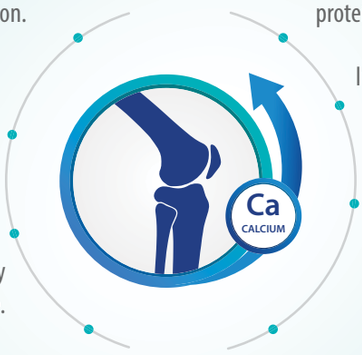
FOStering stronger bones – Beta palmitate and Fructooligosaccharide (FOS) advantage

FOS are prebiotic, non-digestible bifidogenic oligosaccharides, also commonly referred as fructans or oligofructose, and have a terminal glucose unit linked in a β position.[1]

Glucose unit linked at β position in FOS is unique and human digestive enzymes are specific for α position hence they cannot metabolise FOS, which in turn reach the colon undigested. There they undergo fermentation by beneficial bifidobacteria. SCFAs -the by-products of bacterial fermentation, are mainly responsible for health benefits like mineral metabolism.[1]

Role of FOS in Calcium Metabolism:[2]

- Improves calcium absorption through passive diffusion.
- Lowers intraluminal pH thereby increases solubility of calcium.
- Enhances calcium absorption via ion exchange.
- Stimulates cell growth thereby increasing absorption surface.
- Stimulates levels of ca-binding protein expression.
- Increases calbindin levels.
- Stimulates transcellular active calcium transport.
- Increases bone mineral density & reduction of urinary deoxypyridinolin & thus supports in bone modulation.



The most prevalent saturated fatty acid in human milk is palmitic acid (PA), which is highly concentrated at the sn-2 position (also known as beta palmitate)[3]

Role of Beta Palmitate in mineral metabolism [3,4]

Sn-2 bond(β) plays is very crucial role in digestion and subsequent fat absorption.

The sn-1 and sn-3 locations of fatty acids are separated by pancreatic lipase during digestion, whereas the -sn-2 position is largely resistant to this enzyme's lytic action.

The digestion of PA esterified at sn-1 and sn-3 positions leads to production of free palmitic acid, which forms compounds with dietary minerals such as calcium to form fatty acid soaps hence both fatty acids and calcium are lost in stool.

β palmitate, due to its binding at sn-2 position is better absorbed and does not create compounds with calcium, thus improving calcium absorption which positively influences mineralization of the growing skeleton, improving bone matrix quality.

A double blind randomised study on formula fed term infants and breastfed term infants, evaluated alterations to the standard formulas , where the experimental formulas had higher β palmitate levels as well as there was inclusion of oligofructose (non-digestible carbohydrate).The results showed significant benefits in infants including reduction in faecal losses of fatty acids (palmitate) and calcium, better absorption of calcium with increased abundance of bifidobacteria, making the outcomes of formula fed infants similar to breast fed infants.[4]

Infant formulas containing higher concentration of β palmitate and FOS positively lower calcium waste, and improve calcium absorption, thereby supporting bone growth.[4]

References:

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