

Milk and Growth in Children: The Effects of Whey and Casein

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Consumption of cow's milk in childhood is recommended in many countries. Cow's milk has a content of protein and minerals needed for growth with protein content about three times as high as the content in breast milk. Furthermore, the ratio between whey and casein is very different, 20/80 and 60/40 in cow's milk and human milk, respectively. In infant formula, both the amount and the whey/casein ratio have been adjusted to be close to human milk because it is suggested that the composition of human milk is optimal for healthy growth in infants. However, the type and content of specific proteins in the whey and casein fractions are also different in cow's milk compared to human milk.

A review published a few years ago [1] summarizing observational and intervention studies concluded that cow's milk most likely has a positive influence on growth in children. The strongest evidence comes from observational studies and intervention studies in low-income countries, but there are also observational studies from high-income countries showing an association between milk intake and growth [1, 2]. A new study from the US with young girls also found that among different nutrients/foods examined, the growth in height was strongest associated with dairy protein [3]. However, the effect of milk on growth may not be the same in all age groups [4]. Thus, milk seems to have a specific stimulating effect on linear growth, not only in developing countries with high rates of malnutrition, but also in industrialized countries [1].

It is not known which components in milk may have the growth-stimulating effects. Possible components are proteins/peptides, minerals (calcium, phosphor), vitamins or combinations of these. In relation to protein quality and growth, several indexes for protein quality based on the amino acid composition have been used, e.g. PDCAAS [2]. According to most of these indices, whey has a slightly higher quality

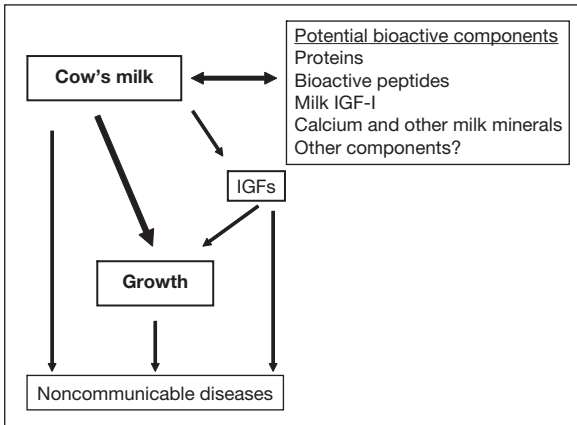


Fig. 1. Possible associations between milk consumption, growth and health. Modified from Hoppe et al. [1].

than casein. But it is not known to what extent this in practice has influence on the growth-stimulating effects of the two milk proteins.

Studies have suggested that whey protein also has the potential to increase muscle mass [2], which may be beneficial for a healthy body composition in children. Most studies are from sports medicine, and have shown an effect if a mixture of slow and fast absorbable milk proteins like in cow's milk are taken immediately in relation to endurance training. The constituents in whey in cow's milk have also a number of other potential beneficial functions, e.g. immune stimulation, which in some cases could be positive for growth.

The mechanism behind a possible growth-stimulating effect of milk is likely to be through a stimulation of IGF-I synthesis (fig. 1) [5, 6]. It has been shown that milk in contrast to meat stimulates IGF-I [5]. However, milk also seems to stimulate insulin secretion [7], which in children may be positive in relation to growth, as insulin is an anabolic hormone inhibiting proteolysis. In a more recent study, we have shown that whey is mainly stimulating insulin secretion, while casein has a stronger effect on IGF-I levels [8]. So, a mixture as in cow's milk products may be better to stimulate both IGF-I and insulin and thereby growth.

In conclusion, there is strong evidence that milk stimulates linear growth. The mechanism is not yet clear and more intervention studies are needed to understand which components in milk are responsible for growth stimulation. The effects of milk on linear growth and adult height may have both positive and negative long-term effects.

References

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