# How fat is too fat? Development of body composition over the first year of life in breastfed infants

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More and more benefits of being breastfed are being documented in the literature. The diseases for which risk factors are reduced in children that are breastfed include cancers such as childhood leukaemia and lymphoma, non-alcoholic fatty liver disease and endometrial cancer and as well as non-communicable diseases such as cardiovascular disease and type 1 and 2 diabetes.

The mechanisms by which these protective benefits are conferred to the baby are still elusive because of their complexity. Animal models, however, provide further support for the idea that nutrition provided to babies very early in life impacts both obesity and metabolic programming and subsequently disease risk later in life.

Constant signalling occurs between the mother and foetus during pregnancy impacting foetal growth and development. Breast milk may be perceived as an extension of maternal signalling modulating growth, development and programming in the first 2 years of life. Many of the infant benefits of breastfeeding are dose dependent with the greatest benefit occurring with the longest durations of breastfeeding.

Breast milk contains a plethora of components that remain active when ingested by the infant and therefore it stands to reason that they could potentially regulate infant appetite and body composition. Many studies have tried to find relationships between the concentration of components in the milk and infant body mass index (as an indicator of body composition) and have failed. We speculated this absence of relationships was because the dose or amount of the component had not been measured. Indeed, in our recent research where we made longitudinal measurements of mothers (milk production and composition) and babies (growth and body composition) over the first year of life we confirmed this suspicion. For example, we have found the amount of the two appetite hormones, adiponectin and leptin, are associated with the development of infant body composition with higher doses being related to higher adiposity[1]. To complicate things a little further, leptin levels in milk are related to the mother's adiposity, a reflection or signal to the baby of her metabolic state. We found the same scenario with casein where an increased dose of casein was related to higher infant adiposity and lower lean tissue accretion[2].

Part of puzzle of how milk affects infant body composition development also lies in breastfeeding patterns and the volume of milk consumed by the baby. Typically we

found if the baby fed more frequently they received more milk over 24 hours, and therefore higher doses of milk components, which were linked to increased infant adiposity[3]. The feeding frequency or milk volume was not however, associated with the mother's adiposity.

One can see there is an emerging trend in the components we have measured where a greater dose of the components relates to the accumulation of more fat with respect to lean tissue. If we accept that the breastfed infant's body composition is optimal the greater adiposity deposition in preterm infants at 40 weeks post conception is suboptimal. This is a likely response to their nutrition, which typically includes bovine fortifier contributing to a greater dose of particular components. Thus we should view the breastfed infant's body composition as the norm, and understanding the mechanisms responsible for body composition development will present opportunities to improve infant health.

**References**

1 Gridneva, Z., et al., *Human Milk Adiponectin and Leptin and Infant Body Composition over the First 12 Months of Lactation.* Nutrients, 2018. **10**(8).
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