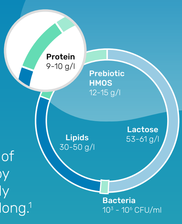
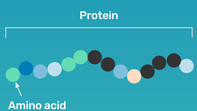
Proteins in breastmilk

What are proteins in breastmilk?



Proteins are compounds consisting of amino acids, which are connected by peptide bonds. Proteins are generally between 50 and 2000 amino acids long.[1]



Amino acids can also be present detached from proteins in breastmilk, as free amino acids.[2,3]

There are two principal groups of protein in breastmilk: **casein and whey**.[4]

Casein and whey each comprise a remarkable array of specific proteins, since over 1500 different proteins have been identified in breastmilk.[5]

Why are proteins important in breastmilk?

Serve as an **energy source:** breastmilk proteins provide around 7% of total energy in mature milk[4-7]

As **building blocks** for bones, muscles, and organs[4-7]

Assist in the **absorption of minerals**, such as calcium and zinc[4-7]

Protect against infections, by functioning as immune factors (for instance as antibodies)[4-7]

Supporting **immune system maturation**[4-7]

Supporting **gut function**[4-7]

Do proteins vary in breastmilk?

Among the macronutrients, the variation in absolute amounts of protein is less prominent.

Studies have reported that **proteins** in breastmilk vary:

Following mother's age: some studies have suggested that older mothers produce milk with lower protein levels compared to younger mothers[8,9]

Over gestational age: higher levels of protein were found in milk produced for preterm infants, compared to term infants[4,11,12]

Over the course of one feeding: hindmilk (the last milk of a feed) may contain **higher** protein and **lower** free amino acids concentrations, compared to foremilk (the initial milk of a feed)[10]

Between infant genders: differences in protein and free amino acids levels have been reported between milk produced for sons and daughters[12,13]

Over lactational stages: protein concentration is generally highest in colostrum[3,4]

Over geographical regions: differences in some proteins and amino acids between ethnicities and geographical regions were reported. Genetic and lifestyle factors could cause these variations[12,14]

And additionally, the whey/casein ratio also changes over the lactational stages[7]:

	Whey / casein ratio
Colostrum	90:10
Transitional	60:40
Mature	50:50

References:

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