

“Lactoferrin and its capacity as a regulator of oral flora and the immune system”



What is lactoferrin?

Lactoferrin is a protein present in milk as well as in many human and mammalian bodily fluids and cells. In terms of the innate immune system, it plays an important role inhibiting bacteria, viruses, even some fungal pathogens and also by regulating inflammation.

It is breast-fed newborns who benefit primarily from the lactoferrin in mothers milk which both protects them from harmful germs whilst at the same time promoting the development of beneficial gut microbiota.

Adults can also benefit from these properties due to the fact that lactoferrin is easily digestible and quite safe. Due to the fact that it contains no lactose, the protein can also be taken in cases of lactose intolerance.

Role of lactoferrin

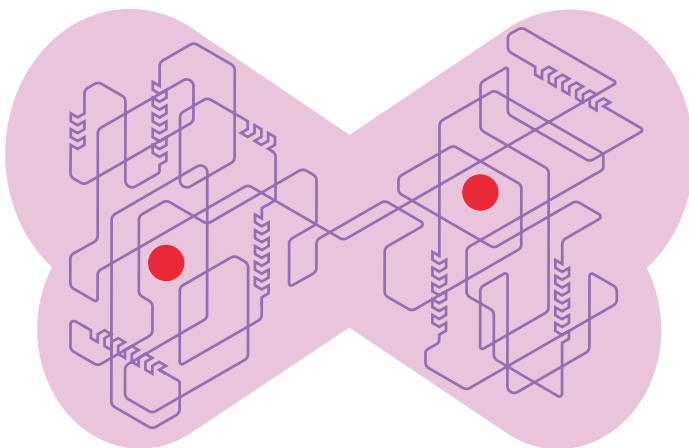
Lactoferrin is integral to the newborn's immune system. It also plays a role in the immune response of adults. Lactoferrin is released by some of our leukocytes - more specifically it is present in the secondary granules of neutrophils - and is part of our innate immune system. Lactoferrin was named after its occurrence in milk (Lat. lacteus). It can be found, highly concentrated, in breast milk but also in other bodily fluids and in cow's milk.

Lactoferrin is a component of the nonspecific defence system against various pathogens. The body, wishing to prevent bacteria multiplying and invading the organism, enriches our bodily fluids, for example tears, saliva or sweat, with lactoferrin. However, the quantity of lactoferrin produced naturally in our bodies appears to be insufficient in response to today's stress and modern lifestyle.

Fortunately, human and bovine lactoferrin (from cow's milk) are almost identical and fulfil the same function. Therefore, purified lactoferrin from cow's milk is also well-suited to support the human immune system.

Properties of lactoferrin

Lactoferrin has the capability to fight pathogens all over the body. Harmful bacteria present in the mouth include *porphyromonas gingivalis*, *fusobacterium nucleatum* and *streptococcus mutans*, which contribute to tooth decay. Lactoferrin fights these bacteria in several ways: Firstly, lactoferrin can bind iron ions. As a result, any bacteria nearby are deprived of this vital trace element. Bacterial growth is slowed and even stopped completely.^[1] In addition, the lactoferrin damages the outer membrane of the bacteria via an oxidation process which increases its permeability.^[2] This is particularly damaging for microbes. Lactoferrin can also destroy the proteins of certain species of bacteria; proteins which play a decisive role in the degree of pathogenicity of the bacteria.^[3]



Simplified model of lactoferrin; iron atoms marked in red

Lactoferrin is fundamentally a protein and more specifically a Glycoprotein. This means that it is composed of a single chain of amino acids, typical for proteins, with attached carbohydrate chains. Human lactoferrin comprises 691 amino acids and has a molecular mass of approximately 80 kDa.

Lactoferrin does not damage all bacteria. It actually promotes the growth of positive, probiotic oral bacteria like *Lactobacillus plantarum* [4] as well as other probiotics in the intestines.[5]

Probiotics like *L. plantarum* have a beneficial effect on organisms and support the normal functions of the body. It has been shown that *L. Plantarum* exhibits antioxidant properties and is important for maintaining a normal permeability of the intestines.[6] Many probiotics also fight actively against pathogens multiplying and spreading in the mouth.[7]

Lactoferrin also functions as a regulator of the immune response and is able to weaken the inflammatory processes[8] which it achieves through its interaction with pro-inflammatory cytokines, for example, IL-1 α , IL6, IL-8 and TNF α . [9] This is only possible when lactoferrin has few impurities, as non-purified, commercial lactoferrin can even go so far as encouraging inflammation.[10]

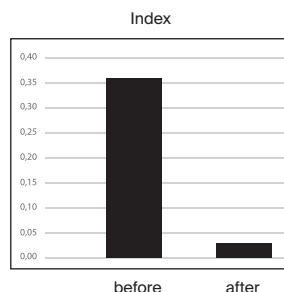
Unique composition of FLORAL

FLORAL mouth and dental care lozenges, with their unique combination of 50 mg Lactoferrin CLN® and 500 mill. probiotic lactobacilli per lozenge promote healthy, balanced oral health and prohibit the unpleasant effects of a bacterial imbalance.

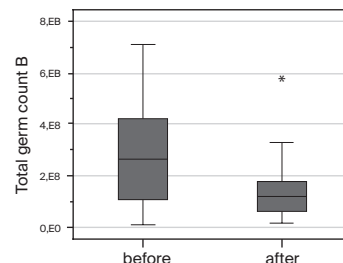
The positive effect of lactoferrin on gum disease has been confirmed in the case of periodontitis.[11,12] In addition, further study has shown beneficial effects of lactoferrin on wound healing after an injury – the healing process can be accelerated up to twelve times which is particularly useful for the treatment of gum tissue wounds.

In addition to pure lactoferrin, FLORAL contains cultures of both probiotic *L. plantarum* and *L. brevis*. Together, lactoferrin and these lactic acid bacteria fight pathogens in the mouth with an even greater effect. An observational study shows that after taking FLORAL for 4 weeks, the number of cavities and gingivitis bacteria in the mouth had reduced significantly:

Change in the Gingival Index (> 90 %)



Reduction of bacteria associated with cavities



FLORAL is taken daily after teeth cleaning in the form of a lozenge which is dissolved slowly in the mouth. Therefore, it remains for as long as possible in the mouth and is more likely to reach the deeper periodontal pockets which are particularly difficult to reach. This product is suitable for the prevention of various symptoms caused by undesirable oral bacteria.

FLORAL can protect those who are particularly susceptible to gum disease (like periodontitis or gingivitis), or dental disease. This may apply to women going through hormonal changes (during pregnancy or menopause), but also to anyone with a weakened immune system.

Taking FLORAL can also reduce halitosis by encouraging healthy microflora and eliminating unwanted bacteria and is therefore suitable for anyone wanting to supplement their daily oral hygiene effectively. FLORAL is also recommended for anyone preferring a more natural dental prophylaxis and therapy support.

We also recommend taking FLORA after dental procedures or antiseptic mouth washes to support healing and to prevent the growth of oral, pathogenic flora.

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