

Lactoferrin to Boost Immune against Coronavirus

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Abstract: Virus responsible for SARS disease spread during 2003, SARS-CoV, primarily binds to Heparan Sulphate Proteoglycan (HSPG) sites of human cell membrane. Lactoferrin has the ability to pre-bind HSPG sites and block SARS-CoV interaction on human respiratory tract. Novel coronavirus (SARS-CoV-2) has certain close similarities with SARS-CoV. Based on the available literature, it is hypothesized that human colostrum and dairy products containing Lactoferrin can boost immune system to fight against novel coronavirus.

Keywords: Novel corona virus, Lactoferrin, Colostrum, Heparan Sulphate Proteoglycan

1. Introduction

Lactoferrin or Lactotransferrin is a globular glycoprotein belonging to transferrin family [1]. Transferrins are iron-binding blood plasma glycoproteins that control the level of free iron in biological fluids. Human colostrum (first breast milk) has the highest concentration of lactoferrin followed by human milk and then cow milk. [2, 3]. Several studies showed that lactoferrin displays anti-viral activity against both DNA and RNA viruses [4-6].

Corona Virus Disease – 2019 (COVID - 19) is caused by a novel coronavirus named SARS- CoV-2 (Severe Acute Respiratory Syndrome Virus - 2), which has close similarity with SARS- CoV, the virus responsible for SARS disease outbreak during 2003. Both SARS-CoV and SARS-CoV-2 are emerged in China, probably originated from bats. They might be transmitted to host animals like civet cats before attacking humans. The whole genome of SARS-CoV-2 has 70– 80 % similarity with SARS-CoV. Both these viruses use same cellular receptors for human cell entry [7].

Coronavirus entry into cell is a complex process, first step being virus bind to the attachment receptor. In the following step virus interact with fusion receptor thereby making cell membrane permissive. Heparan Sulphate Proteoglycans (HSPGs) provide the first anchoring site on the cell surface and helps the virus to make primary contact with host cell. In the further step virus utilizes the fusion receptor angiotensin – converting enzyme-2 (ACE2) to make the cell permissive. Both HSPGs and ACE2 are found in the lower respiratory tract of humans [8].

It has been scientifically shown that lactoferrin has the capability to bind on HSPG sites, ie, lactoferrin is able to prevent virus interaction with cell membrane by pre-binding the HSPGs thereby exerting a protective role against SARS-CoV infection [8-10]. Schematic representation of SARS-CoV cell entry and inhibitory action of Lactoferrin, adopted from reference 8, is provided in figure 1.

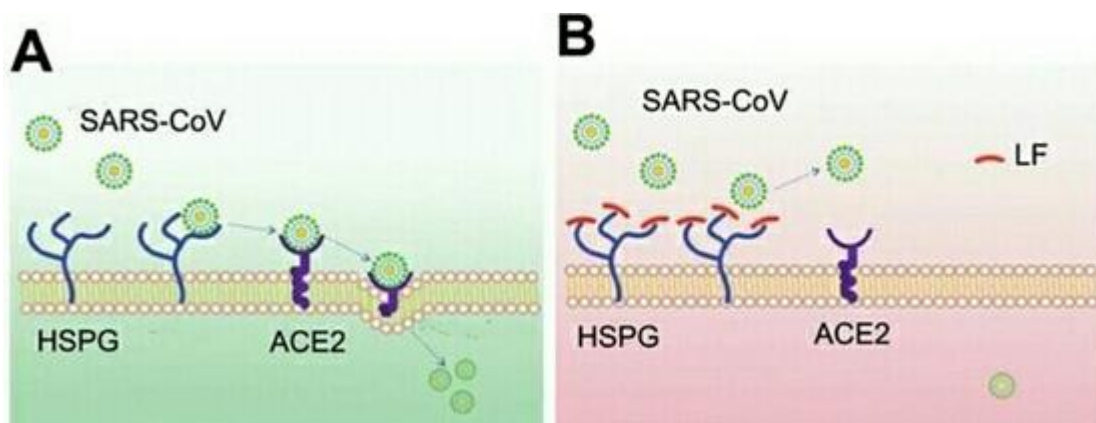


Figure 1

(a) Binding of SARS-CoV on HSPG site and subsequent cell entry through ACE2.

(b) Pre-binding of Lactoferrin on HSPG site to inhibit SARS-CoV adhesion and cell entry

Lactoferrin, being a food component, can be easily consumed to boost immune against viral infection. China has already started promoting dairy and dairy product consumption to strengthen public immune resistance to combat novel coronavirus outbreak [11].

These points are based on the literatures available on interaction of SARS-CoV with cell membrane. In spite of

some genetic similarities with SARS-CoV, SARS-CoV-2 has its own genetic and clinical features. The epidemic trajectory of both looks different in terms of transmissibility, clinical severity, extent of community spread etc. The mechanism of interaction of SARS-CoV-2 with cell membrane is not elucidated and no clinical studies are available. However, in the light of existing studies, it can be hypothesized that Lactoferrin can boost human immune

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system to fight against novel coronavirus by blocking the adhesion sites. Individuals with poor immune system are at high risk of serious respiratory disease consequences. So lactation and consumption of dairy products are advisable as a preventive measure to combat novel coronavirus infection.

2. Conclusion

Relying on the genetic similarities between SARS-CoV and SARS-CoV-2, Lactoferrin, having the ability to bind and block the adhesion sites of virus on human cell membrane, can be considered as a dietary inhibitor of coronavirus. In the current scenario of COVID-19 outbreak, lactation and consumption of cow milk and other dairy products, being the major sources of lactoferrin, can be promoted among public to strengthen their immune resistance against novel coronavirus. However this hypothesis needs to be scientifically confirmed and clinically proved through specific studies on SARS-CoV-2 interactions with human cell membrane.

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