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Possible anti-inflammatory role of Probiotics in the treatment of Covid-19 disease

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Abstract

Covid-19 is a deadly viral disease prevalent in the world. As a result of the viral disease, a serious inflammatory response develops in the organism. Various research results have reported that the development of this response causes damage to various organs and tissues. Compounds with anti-inflammatory action can reduce or prevent the potential harm caused by this inflammatory response to the organism. Several recent studies suggest that probiotics have powerful anti-inflammatory properties. In conclusion, this study addressed the potential anti-inflammatory effects of probiotics in Covid-19 disease.

Keywords: anti-inflammatory, probiotics, covid-19

Introduction

Covid-19 disease, which causes acute respiratory syndrome and is seen all over the world and is quite deadly, is one of the controversial issues (1). Clinical symptoms of this disease, such as diarrhea, cough, fever, and shortness of breath, are present (2). The clinical signs are mostly asymptomatic or mild (1, 3). In addition, COPD, coagulation disorder, kidney damage, metabolic acidosis, heart failure, or secondary infections can all result from COVID-19 infection (2, 4-12). There is substantial evidence that systemic hyperinflammation contributes to lung and multi-organ failure in Covid-19 patients (1). It was determined that D-dimer, C-reactive protein, IL-6, and procalcitonin levels were increased in the sera of Covid-19 patients. This condition is associated with macrophage activation syndrome and hyperinflammation (3).

Macrophages and monocytes play an important role in the inflammatory responses associated with Covid-19 infection (13). These cells secrete proinflammatory cytokines such as TNF-alpha, IL-1, IL-6 and IL-8 during infection. Excessive cytokine release in Covid-19 disease causes development of multi-organ failure and worsening of the condition (2, 14-17). Consequently, anti-inflammatory agents are critical in the treatment

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of Covid-19 disease to reduce disease severity. Identifying new agents in addition to the currently known therapeutic agents will help develop strategies to combat the pandemic (1). Probiotics are live microorganisms that have been shown in numerous studies to suppress inflammation and protect tissue from the effects of inflammation (14-17). In line with this information, probiotics may be effective in relieving inflammation caused by covid-19. The aim of this study, according to this information, is to explain the effect of probiotic use in addition to existing agents in the treatment of covid-19-induced inflammation.

Morphology of the virus and its attachment to the cell: According to its morphological structure, the Coronavirus is a single-stranded (+) RNA-enclosed virus (18). Photos taken with an electron microscope in 1968 revealed that this virus family resembles the "solar corona," which derives its name from the Latin word "coronavirus" (19).

Four primary structural proteins have been identified in the coronavirus structure. These proteins include: S is a trimeric Spike glycoprotein found on the viral envelope's surface that is required for viral entry into cells. Matrix or membrane protein M is the name given to the second protein. E, the third protein, is a small envelope protein needed for virus collection and release. The nucleocapsid protein, N, is the fourth protein. It forms the symmetrical nucleocapsid by helically attaching to the RNA genome (Figure 1). (20). The virus was thought to enter cells via the ACE2 protein, which is found in abundance in the testis, heart, lung, kidney, and gastrointestinal tract (21). Ang II is converted into Ang 1-7 by the membrane-bound protein ACE2 (22). Several steps are involved in the Covid-19 infection cycle: These are the procedures. 1. Locate and bind to the cell's receptor (S). The second modification affects the structure and proteolysis of the S protein. The third step is fusion with the cellular membrane (23, 24, 25). Figure 1.

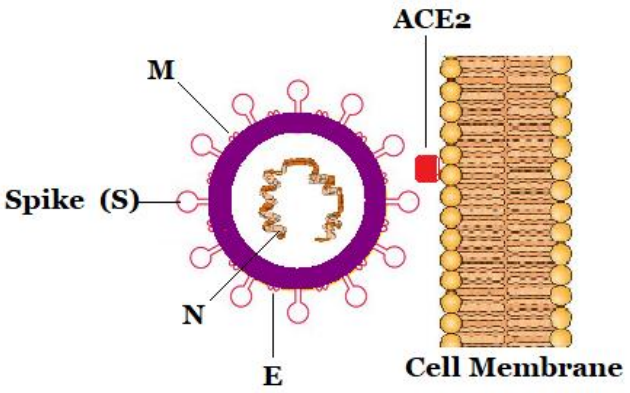

Figure 1. The structure of the coronavirus and its entry point into the cell (26).

The Covid-19 is experiencing a cytokine storm: The cytokine storm caused by Covid-19's inflammatory response may be associated with clinical deterioration and an increased risk of death (27). Blood levels of cytokines increased in Covid-19 patients (28). Furthermore, in severe Covid-19 patients, G-CSF, MCP1, IP10, IL-2, and TNF-alpha levels were found to be quite high (28). The study showed that people who died from severe Covid-19 infection had extremely high IL-6 levels (29).

In one study, a cytokine storm was divided into two stages (30). The absence of immunity is the first stage. A hyperactive immune response characterizes the secondary stage, which appears to be a clinical manifestation of a cytokine storm (31, 32). Low IFN activity and IFN-induced gene down-regulation have been shown to impair type 1 IFN responses as well as IL-6 and TNF-mediated hyper-inflammatory responses (33-38).

Probiotic effect on immune responses: When used correctly, probiotics are living microorganisms that contain a variety of bacteria and yeast strains and have beneficial effects on the host. Leuconostoc, Pediococcus, Lactobacillus, Bifidobacterium, and Enterococcus are all probiotic bacteria (40). Probiotics regulate, and modulate a variety of functions in the intestine, including digestion, metabolism, and brain-intestinal communication (41, 42). Non-toxic

metabolites produced by intestinal microorganisms play important roles (43-45). Probiotics fulfill three roles including metabolic, protective, and trophic (46). Probiotics produce energy by fermenting indigestible foods known as prebiotics, and they have antipathogenic, antiobesity, antidiabetic, anti-inflammatory, anticancer, and angiogenic properties, as well as effects on the brain and central nervous system (47).

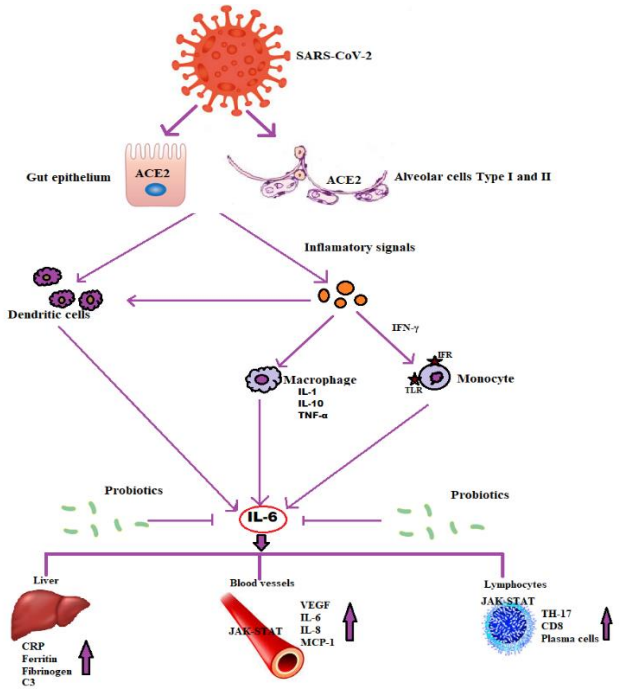

Figure 2. Covid-19 is in the grip of a cytokine storm. Probiotics have anti-inflammatory properties. TNF- stands for tumor necrosis factor alpha; IFN stands for interferon; IL stands for interleukin; and JAK/STAT. CD8 is an abbreviation for cluster of differentiation 8, TH-17 is an abbreviation for T helper 17, and VEGF is an abbreviation for vascular endothelial growth factor. MCP-1 is an abbreviation for monocyte chemoattractant protein-1, and CRP is an abbreviation for C-reactive protein. C3 is an abbreviation for complement component 3, ACE2 is an abbreviation for angiotensin-converting enzyme 2, TLR is an abbreviation for toll-like receptor, and IFR is an abbreviation for interferon (39).

Probiotics have important roles in humoral, cellular and nonspecific immunity. In addition, studies have shown that probiotics also have an effect on the immune barrier (48, 49). It has been reported that probiotics increase peripheral immunoglobin production, stimulate IgA secretion and inhibit the production of proinflammatory cytokines (50, 51). Probiotic bacteria regulate epithelial cell proteasomal activity and it has been determined that they may play a role in the epithelial-derived T cell activation mechanism of the intestine (52, 53). It has been shown that probiotics produce non-living metabolic byproducts such as bacteriocins and organic acids that are resistant to mammalian enzyme systems, non-toxic and non-pathogenic, and can be used as an alternative to antibiotics due to their biological activities and inhibitory properties (54, 55). Probiotics increase antioxidant production (glutathione) and reduce oxidative stress, according to some studies. Probiotic microorganisms inhibit lipid peroxidation and reduce STZ-induced oxidative damage in rat pancreatic tissues (56, 57). Various studies have revealed the basic molecular mechanisms of probiotics, such as IgA secretion, cytokine production, antibacterial agent production, tight junction enhancement against intercellular bacterial invasion, and competition for enterocyte adhesion with novel pathogenic microorganisms. The immunomodulatory effect of probiotics is closely related to the release of cytokines from immune cells such as lymphocytes, granulocytes, and macrophages (58).

Probiotic strains influence the gut barrier by inducing IgA production in B cells. In vitro, probiotics have been shown to influence cytokine production by antigen-presenting cells (APCs), which initiate adaptive responses in enterocyte cells. Cytokines also help the immune system fight of fungi, viruses, bacteria, and other pathogens. Immunostimulatory probiotics fight inflammation and cancer cells by increasing IL-12 production, which activates NK cells and promotes the proliferation of Th1 cells. Probiotics can also aid in the treatment of allergies by balancing the Th1 and Th2 immune systems. Immunomodulatory probiotics, on the other hand, have been shown to decrease allergies, inflammatory responses, and IBD by increasing IL-10

and Treg cell production (59). Probiotics have anti-inflammatory properties. Probiotics boost IL-10 while suppressing IL-12. (60). Probiotics either activate the immune system by increasing levels of IL-12, IL-1, and TNF-α, or they act as an anti-inflammatory by increasing levels of IL-10 and TGF-β (61). T helper cells contribute to immune responses. Proinflammatory cytokines are produced by Th1/Th17 cells. Treg cells inhibit T cell functions like Th1, Th2, and Th17. IFN and IL-10 levels can be reduced in L. plantarum and B. infantis (62, 63). Probiotic mixtures can also reduce the production of proinflammatory cytokines such as IL-17, IFN, and TNF-α while increasing the production of IL-10 and/or Treg cells (64). Morbidity increases during acute lung infection, according to in vivo studies on mice that do not contain microorganisms (65). Another study discovered a link between Mycobacterium tuberculosis infection severity and the intestinal microbiota (66). Furthermore, as a result of previous research, we discovered that probiotic application suppressed the increase in cytokines, which increased as a result of inflammation caused by various toxic agents in rats (14-17).

CONCLUSION

As a result, a more effective treatment method for the highly contagious and lethal coronavirus epidemic has yet to be discovered. This situation motivates researchers to seek alternatives to human coronavirus infections. According to various studies, probiotics play an important role in reducing inflammation in various tissues. Coronavirus has been shown to cause severe inflammation and death after tissue damage in a variety of tissues. Coronavirus has been shown to cause severe inflammation and death after tissue damage in a variety of tissues. In this context, we believe that the probiotics mentioned can be used as an alternative to the current anti-coronavirus agents.

Declaration of Interest: No potential conflict of interest relevant to this article was reported.

Authors' Contributions: VG and EŞ contributed to the study conception and design. Literature research (VG and EŞ), Writing the article (VG). All authors read and approved the final manuscript.

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