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Probiotic Adequacy for Post-Acute Corona Syndrome

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ABSTRACT

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Severe acute respiratory syndrome coronavirus (SARS-CoV-2) is a novel coronavirus that causes coronavirus disease (COVID-19) in humans, a respiratory infection that was first reported in Wuhan, China in December 2019. This SARS-related coronavirus is a member of the zoonotic beta-coronavirus family [1,2]. The incubation period for COVID-19 is 1–14 days [2]. The clinical manifestations of COVID-19 are variable, ranging from asymptomatic to severe illness. Asymptomatic patients can serve as sources of disease dissemination [2,3]. Common symptoms of COVID-19 include fever, dry cough, and shortness of breath, myalgia, and fatigue. Headache, rhinorrhea, sneezing, sore throat, loss of odor and pneumonia are other reported symptoms of COVID-198. Other uncommon manifestations of the disease include gastrointestinal symptoms such as diarrhea, nausea, vomiting, and abdominal pain [3,4]. The gastrointestinal tract and lung are among the body compartments that host microbiota; however, the lung has a small number of microbiota when compared to that of the gut [5]. There is accumulating evidence that bidirectional communications exist between gut and lung, which is called the gut-lung axis. This bidirectional crosstalk is involved in the support of immune homeostasis [6]. It is believed that the gastrointestinal inflammation results in lung inflammation through this connection [7]. The exact mechanism underlying this inflammatory shift from the gut to the lung is not yet completely revealed; however, dysbiosis of gut and lung microbiota is one of the implicated factors in this event. It has been shown previously that dysbiosis of gut microbiota is linked with several respiratory pathological conditions [7,8] and shifts in the composition of the lung microbiota toward the gut microbiota have been observed in several respiratory disorders [5,9].

One of the suggested mechanisms behind the bidirectional interaction between lung and gut microbiota systems is that increased permeability of the GI tract allows the leakage and migration of the gut microbiota to the lung, modulating its microbiota and thus its immune responses [5]. Probiotics are live microorganisms that confer a beneficial physiological effect on the host when administered at adequate amounts. Some lactic acid bacteria that can be found in different fermented foods such as yogurt, cheese, and pickles are generally recognized as safe and classified as probiotics because of their health benefits [10]. It was suggested that probiotics should be consumed daily at doses of 108 to 1010 CFU to produce health benefits in humans. The approved health benefits include reducing symptoms of lactose intolerance by improving lactose digestion, inhibiting the initiation of allergic diseases, maintaining intestinal pH, preventing or treating ischemic heart syndromes, reducing blood cholesterol levels, producing vitamins B, improving the bioavailability of dietary calcium, and boosting immune activity.

Meanwhile, other potential health benefits such as the treatment of acute diarrheal diseases and prevention of cancer and tooth decay require additional research for validation [11]. Probiotic bacteria

have been shown to have a number of beneficial immune and health effects. They not only enhance the bioavailability of nutrients and moderate health, but they are also involved in regulating the bacterial ecosystem and module immune cells. Antibiotics are not recommended for treating viral infections because of their inactivity against viruses and disruption of the normal human microbiota. Probiotics exhibit potent antimicrobial activity against several pathogens. In the past two decades, probiotics have been proposed as antimicrobial agents against viruses causing respiratory tract infections [12]. Evidence supports probiotics' role in regulating the immune system, suggesting a definitive role for probiotics in viral infections. Probiotics supplementation could reduce the severity of COVID-19 morbidity and mortality. Probiotics can inhibit cytokine storm by simultaneously boosting the innate immunity and evading the exaggeration of adaptive immunity, which is challenged to respond quickly to the viral onslaught.

Probiotics-induced suppression of the inflammatory cytokine response may prevent both the severity and the occurrence of ARDS, making probiotics an attractive adjunct. Inventing effective therapy will transform the impact of the pandemic on lives as well as economies across the globe. Therefore, supplementation of probiotics in high risk and severely ill patients, and frontline health workers, might limit the infection and flatten the COVID-19 curve. However, currently, there are no RCTs to demonstrate conclusive evidence. On the other hand, circumstantial evidence has supported the presumption that probiotic supplementation decreases the severity of COVID-19 responses, including mortality. Many clinical trials are underway globally to delineate the role of probiotics in both prevention and treatment of COVID-19. Emphasized the intervention of diet, prebiotics, probiotics, and synbiotics that can be used as prophylactic measures for modulation of the gut microbiome [13-17]. Also, scientists are trying to underpin the role of probiotics that can be envisaged in the form of several clinical trials that are still under investigation.

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