

## The Neglected Role of Lung Microbiota in COVID-19

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### Dear Editor,

Recently, the world has been faced with a significant public health crisis due to a new Coronavirus disease called Covid-19. It affects the human upper and lower respiratory tract, which varies from cold to severe complications. Patients may experience common symptoms of fever, dry cough, myalgia or fatigue, headaches, and diarrhea. The most worrisome complication of Covid-19 is acute hypoxic respiratory failure. As Covid-19 progresses, complications including acute lung injury (ALI), acute respiratory distress syndrome (ARDS), or respiratory failure may occur within a few days. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) attaches to the surface of epithelial cells and alters the airway epithelium structurally and functionally [1].

The lungs, like other parts of the body, possess a normal flora. Although the microbial community is frequently renewed and replaced, there are some abundant microbe genera in the

lungs, including *Prevotella*, *Streptococcus*, *Veillonella*, *Neisseria*, *Haemophilus*, and *Fusobacterium* [2]. The role of the lung microbiota is believed to be promotion and maintenance of immune tolerance, and prevention of the uncontrolled and undesirable inflammatory responses caused by inhaled allergens [3]. This effect is achieved by constant communication between common bacteria and immune cells residing in the lungs, which expresses a set of receptors that can detect microorganisms [4]. These receptors are also involved in identifying pathogens and creating an appropriate immune response. Due to its essential role in maintaining pulmonary homeostasis, we can consider lung microbiota a marker of lung health status [5].

Recent studies have shown that acute and chronic lung diseases can markedly change the microbial communities of the lung bacteria. This, subsequently, affect the progression of the disease and the individual response to therapy [4, 6]. However, considering the potential role of lung microbiota, few studies have been conducted on Covid-19 patients so far. A comparative study of alveolar bronchial fluid in patients with Covid-19 and nosocomial pneumonia with healthy individuals showed a significant change in microbiota composition in patients with Covid-19 and pneumonia. In another study, the characteristics of the lung microbiota in victims of Covid-19 were evaluated. Among the identified types of bacteria and fungi, *Cryptococcus* spp showed a significant increase. These species are



associated with a high mortality rate, especially in the case of immunosuppression and central nervous system (CNS) involvement [7, 8]. Furthermore, antibiotic regimens caused a significant reduction in the immune response to the influenza virus in mice [9], which may be due to changes in the composition of the lung microbiome following exposure to antibiotics.

Probiotics are beneficial living microorganisms for host health when ingested in sufficient amount. Probiotics may have therapeutic potential for SARS-CoV-2 infection by reducing the viral loads and regulating plasma levels of cytokines and enhancing immune responses. There is some evidence that probiotics can reduce the incidence of nosocomial pneumonia in critically ill patients under mechanical ventilation [10]. In addition, probiotics could have a protective effect by inhibiting the SARS-CoV-2 virus receptor, thus preventing the virus from interacting with human cells [11]. Several studies have confirmed the critical role of microbiota in activating the innate and adaptive immune response to viral infections. Therefore, preservation of microbiota and prevention of microbial dysbiosis are essential in the lungs. Since probiotics have the ability to promote the immune system and inhibit the pathogenicity of the virus, we can consider them protective agents for lung microbiota.

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### Authors' contribution

A.S conceived the original idea. PA drafted the manuscript with support from A.S. K.A and M.N.M helped with literature search and supervise the manuscript.

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### Conflict of Interest

The authors state no conflict of interest.

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