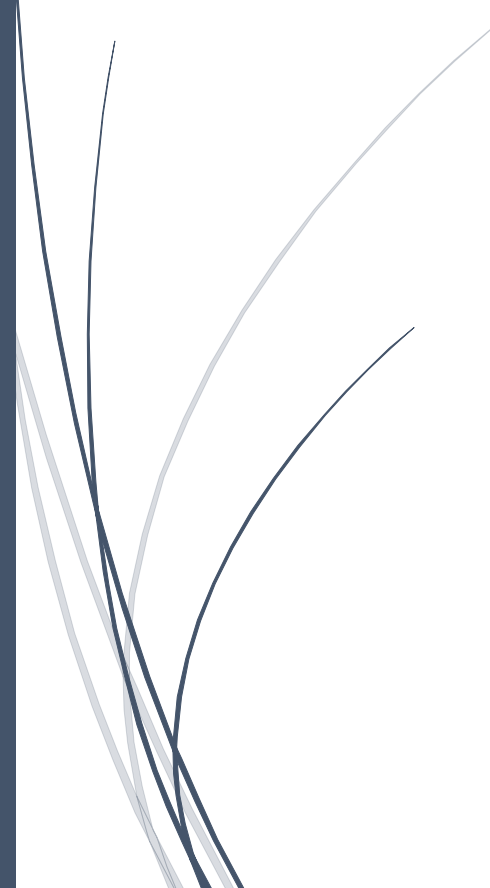


The logo for RADemics, featuring the text "RADemics" in white on a blue arrow-shaped background pointing to the right. The arrow is part of a larger blue graphic element on the left side of the page.

RADemics

# Medicinal Mushrooms and Human Immune Health: Emerging Strategies Against SARS-CoV-2 Infection

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# Medicinal Mushrooms and Human Immune Health: Emerging Strategies Against SARS-CoV-2 Infection

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## Abstract

The emergence of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) and the subsequent COVID-19 pandemic highlighted the critical importance of immune competence in combating viral infections. Although vaccines and antiviral therapies have significantly reduced disease burden, the search for complementary strategies that enhance host immunity remains a priority. Medicinal mushrooms have attracted considerable scientific interest owing to their rich repertoire of bioactive compounds, including  $\beta$ -glucans, polysaccharides, lectins, terpenoids, ergosterols, and fungal immunomodulatory proteins. These compounds possess immunomodulatory, antiviral, anti-inflammatory, antioxidant, and antimicrobial properties that collectively contribute to improved immune function. Several mushroom species, including *Ganoderma lucidum*, *Lentinula edodes*, *Cordyceps* spp., *Grifola frondosa*, *Hericium erinaceus*, *Trametes versicolor*, and *Agaricus brasiliensis*, have demonstrated the ability to stimulate innate and adaptive immune responses through activation of macrophages, dendritic cells, natural killer cells, and T lymphocytes. Recent investigations have also identified mushroom-derived metabolites with potential inhibitory activity against SARS-CoV-2 proteins, suggesting their possible role in viral suppression and mitigation of cytokine-mediated inflammation. Furthermore, mushroom polysaccharides have shown promise in regulating immune homeostasis and reducing oxidative stress associated with severe COVID-19. This chapter examines the role of medicinal mushrooms in promoting human immune health, explores their mechanisms of immunomodulation, and discusses their emerging therapeutic significance as supportive interventions against SARS-CoV-2 infection and future viral outbreaks.

**Keywords:** Medicinal Mushrooms; Human Immunity; SARS-CoV-2; COVID-19; Immunomodulation;  $\beta$ -Glucans; Antiviral Activity; Bioactive Compounds.

## Introduction

Medicinal mushrooms have long been recognized as valuable natural resources for promoting human health and preventing disease. For centuries, they have been utilized in traditional medicinal systems across Asia, Europe, and other regions owing to their nutritional and therapeutic properties [1]. Mushrooms are rich sources of bioactive metabolites, including polysaccharides,  $\beta$ glucans, terpenoids, lectins, and proteins [2], which contribute to a broad spectrum of biological activities such as antioxidant, antimicrobial, anti-inflammatory, anticancer, and antiviral effects [3]. Among the approximately 14,000 known mushroom species, several edible and medicinal varieties have demonstrated significant immunomodulatory potential, making them attractive candidates for enhancing human immune health and disease resistance [4, 5].

The COVID-19 pandemic caused by SARS-CoV-2 has generated unprecedented global health challenges and underscored the importance of an effective immune system in controlling viral infections [6, 7]. Coronaviruses primarily target the respiratory system and can induce severe complications, including pneumonia, acute respiratory distress syndrome, and multi-organ dysfunction [8]. Clinical observations have shown that disease severity is closely associated with host immune status and the ability to mount appropriate antiviral responses [9]. Consequently, strategies aimed at strengthening immune defenses have gained substantial attention as complementary approaches to conventional therapeutic interventions against SARS-CoV-2 infection [10].

The human immune system consists of innate and adaptive components that function collaboratively to identify, neutralize, and eliminate invading pathogens [11]. During SARS-CoV2 infection, viral recognition by pattern-recognition receptors initiates a cascade of immune responses involving interferons, cytokines, macrophages, dendritic cells, and lymphocytes [12, 13]. However, dysregulated immune activation may result in excessive production of proinflammatory mediators, commonly referred to as a cytokine storm, which contributes significantly to tissue damage and disease progression [14]. Studies have highlighted the roles of T cells, natural killer cells, and interferon signaling pathways in determining disease outcomes and host protection against coronavirus infections [15]