



# Natural and Synthetic Drugs as Potential Treatment for Coronavirus Disease 2019 (COVID-2019)

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## Abstract

Coronavirus disease 2019 (COVID-19) has become a global pandemic in a short period, where a tragically large number of human lives being lost. It is an infectious pandemic that recently infected more than two hundred countries in the world. Many potential treatments have been introduced, which are considered potent antiviral drugs and commonly reported as herbal or traditional and medicinal treatments. A variety of bioactive metabolites extracts from natural herbal have been reported for coronaviruses with some effective results. Food and Drug Administration (FDA) has approved numerous drugs to be introduced against COVID-19, which commercially available as antiviral drugs and vaccines. In this study, a comprehensive review is discussed on the potential antiviral remedies based on natural and synthetic drugs. This review highlighted the potential remedies of COVID-19 which successfully applied to patients with high cytopathic inhibition potency for cell-to-cell spread and replication of coronavirus.

**Keywords** Antivirus · Chloroquine · Dosage · Pandemic · Plasma · Ivermectin

## 1 Introduction

The emergence of recent coronavirus disease 2019 (COVID-19) has become an alarming issue and shaken the whole world. The new pathogenic strain [1] produced by coronavirus has infected millions of people worldwide that led to massive death since December 2019 [2]. COVID-19 was first identified in Wuhan, China from an unknown source of coronavirus, which gradually spread to the whole world [3–7] and tragically affected human life. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the virus that causes COVID-19 in humans and animals [8–14]. COVID-19 has a similarity with the earlier reported disease called severe acute respiratory syndrome (SARS) caused by severe acute respiratory syndrome coronavirus (SARS-CoV), regarding their symptoms i.e. cough, fatigue, fever, and lower respiratory sign [15–17]. The current pandemic

has compelled the researchers to explore new effective drugs against COVID-19.

SARS-CoV-2 is structurally similar to other coronavirus and is only differentiated by the prominent spike of proteins [18]. Coronaviruses belong to positive single-strand long RNA viruses [19, 20] with numerous structural proteins i.e. envelope (E), spike (S) [21], membrane (M), nucleocapsid (N) proteins contributing or assisting virus for replication [22] and entry in the host [23]. Both SARS-CoV and SARS-CoV-2 have common angiotensin-converting enzyme 2 (ACE2) used as a receptor that is responsible for the respiratory syndrome. Startlingly, the spike-glycoprotein plays an important role for a strong guest host binding with the targets receptor [24]. The Mpro enzyme contributed to the viral replication of coronavirus [25]. The viral proteases (PL-pro and 3-CL pro) are contributed to the cleavage of replicate polyproteins, significant for viral replication [26]. SARS-CoV-2 can also enter into the host via endosomes at low pH, which can be controlled by increasing pH [27]. A comprehensive illustration of the SARS-CoV-2 structure, replication cycle and immune system response is depicted in (Fig. 1) [28, 29].

The phylogenetic tree of coronaviruses consists of four types i.e.  $\alpha$ -coronavirus,  $\beta$ -coronavirus,  $\gamma$ -coronavirus,  $\delta$ -coronavirus [30]. Phylogeny and genomic analysis

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