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Targeting SARS-CoV-2 viral proteases as a therapeutic strategy to treat COVID-19

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Abstract

The 21st century has witnessed three outbreaks of coronavirus (CoVs) infections caused by severe acute respiratory syndrome (SARS)-CoV, Middle East respiratory syndrome (MERS)-CoV, and SARS-CoV-2. Coronavirus disease 2019 (COVID-19), caused by SARS-CoV-2, spreads rapidly and since the discovery of the first COVID-19 infection in December 2019, has caused 1.2 million deaths worldwide and 226,777 deaths in the United States alone. The high amino acid similarity between SARS-CoV and SARS-CoV-2 viral proteins supports testing therapeutic molecules that were designed to treat SARS infections during the 2003 epidemic. In this review, we provide information on possible COVID-19 treatment strategies that act via inhibition of the two essential proteins of the virus, 3C-like protease ($3CL^{pro}$) or papain-like protease (PL^{pro}).

Keywords: 3 chymotrypsin-like cysteine protease; COVID-19; SARS coronavirus; SARS-CoV-2; coronavirus main protease; papain-like cysteine protease.

Figures

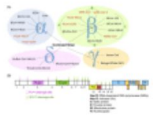

Figure 1 Classification of coronaviruses and polyproteins...

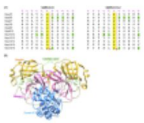

Figure 2 SARS-CoV 3CLpro structure and cleavage...

Figure 3 Cleavage sites and crystal structure...

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