Travel Medicine and Infectious Disease xxx (xxxx) xxxx

Contents lists available at ScienceDirect

Travel Medicine and Infectious Disease

journal homepage: www.elsevier.com/locate/tmaid

Remdesivir for severe acute respiratory syndrome coronavirus 2 causing COVID-19: An evaluation of the evidence

Yu-chen Cao[a,1], Qi-xin Deng[a,1], Shi-xue Dai[b,*]

[a] The Second Clinical School, Southern Medical University, Guangzhou, 510515, Guangdong, China
[b] Department of Gastroenterology, Guangdong Provincial People's Hospital, Guangdong Academy of Medical Sciences, South China University of Technology, Guangzhou, 510080, Guangdong, China

ARTICLE INFO

Keywords:
Severe acute respiratory syndrome coronavirus 2
Corona virus disease 2019
Remdesivir
Phase III clinical trial

ABSTRACT

The novel coronavirus infection that initially found at the end of 2019 has attracted great attention. So far, the number of infectious cases has increased globally to more than 100 thousand and the outbreak has been defined as a pandemic situation, but there are still no "specific drug" available. Relevant reports have pointed out the novel coronavirus has 80% homology with SARS. In the difficulty where new synthesized drug cannot be applied immediately to patients, "conventional drug in new use" becomes a feasible solution. The first medication experience of the recovered patients in the US has led remdesivir to be the "specific drug". China has also taken immediate action to put remdesivir into clinical trials with the purpose of applying it into clinical therapeutics for Corona Virus Disease 2019 (COVID-19). We started from the structure, immunogenicity, and pathogenesis of coronavirus infections of the novel coronavirus. Further, we analyzed the pharmacological actions and previous trials of remdesivir to identify the feasibility of conducting experiments on COVID-19.

1. Introduction

The novel coronavirus 2019 (2019-nCoV), officially named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a newly-emerged human infectious coronavirus. Since December 2019, it has spread rapidly in China in a short period of time. As of March 17, 2020, there have been 81116 confirmed cases and 3231 deaths. It has also outbreak in other countries, such as Korea, Japan, Italy, Singapore, and Iran, with a total of 85296 cases confirmed. Due to it is a newly-emerged virus, researchers have taken quick actions to isolate the virus and perform gene sequencing, making identifying treatments possible. Even so, it takes time to develop new drugs and vaccines, as well as to explore biotherapeutics, thus it is unlikely to be applied to patients with urgent need. Therefore, "conventional drug in new use" becomes a viable solution. The SARS-CoV-2 is 80% homologous with the acute respiratory syndrome-associated coronavirus (SARS-CoV), which also broke out in China in 2002, and some enzymes are even more than 90% homologous [1]. Consequently, we are expecting to find drugs for the treatment of COVID-19 from the experience of SARS-CoV and Middle East Respiratory Syndrome (MERS-CoV). Some drugs, such as ribavirin, interferon, lopinavir, and corticosteroids, have been used in patients with SARS or MERS [2], within the selection range of "conventional drug in new use". Through clinical treatment of the COVID-19, it has been found that neuraminidase inhibitors (oseltamivir, peramivir, zanamivir), ganciclovir, acyclovir, ribavirin are ineffectual and not recommended for clinical application [3]. When we set our sights on the broad-spectrum antiviral drugs, we found that a drug unlisted, remdesivir, has demonstrated strength in trials related to MERS-CoV and Ebola virus infection. In the United States, the first patient with COVID-19 has shown significant improvement in clinical symptoms within 24 h of treatment with remdesivir. This case has convinced the public that remdesivir could become a new "specific drug" for COVID-19. This article starts from the structure, immunogenicity, and pathogenesis of infection of the SARS-CoV-2, and then analyzes the feasibility of conducting trials and putting into clinical use of COVID-19 from the pharmacological characteristics and successful cases of remdesivir.

1.1. Structure and immunogenicity of SARS-CoV-2

SARS-CoV-2 is an enveloped, single, and positive stranded RNA virus. The virus particles are round or oval in shape, with a diameter about 60–140 nm. Based on sequence analysis, it shows that the novel coronavirus belongs to Beta coronavirus Lineage β, Sarbecovirus, where SARS-CoV and MERS-CoV are included. However, it forms a new clade

* Corresponding author.
E-mail address: shixuedai@hotmail.com (S.-x. Dai).
[1] The two authors are equal in contribution to this review.

https://doi.org/10.1016/j.tmaid.2020.101647
Received 5 March 2020; Received in revised form 17 March 2020; Accepted 26 March 2020
1477-8939/ © 2020 Elsevier Ltd. All rights reserved.