



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



ELSEVIER



LETTER TO THE EDITOR

Response to: Status of Remdesivir: Not Yet Beyond Question!

To the Editor,

We thank you very much for this intimation and requesting for a response from our research group regarding this current publication (1). We would like to inform you that we highly appreciate the interest shown by other research group and following a brief description is given to address this particular issue.

COVID-19 is the most serious recent threat which pouncing the current human civilization with an impeccable mode of infection, which left most of the health personals clueless to get a proper answer or a way to fight this deadly virus. In order to develop a novel mechanism to fight this deadly virus, we need to have a complete set of knowledge about this virus. This virus is being studied extensively for the last few months by different scientific communities of various countries and the study is still going on. The disease, COVID-19, is caused by a new type of zoonotic coronavirus known as SARS-CoV-2, first reported in Wuhan city of China. This is not the first time when a type of coronavirus causes serious illness among individuals. Several other coronaviruses have been reported many times earlier, to have the capacity of causing an epidemic. One of them is SARS-CoV, a close relative of this newly found member, which was responsible for causing Severe Acute Respiratory Syndrome in 2002–2003 (Table 1). The disease also originated in China and spread up to 29 countries causing almost more than 8000 infections with a fatality rate of 9.6% (5). Another novel coronavirus was reported in 2012, causing ARDS (acute respiratory diseases syndrome) like pulmonary syndrome with multiple organ failure, was known as MERS-CoV, but this virus was first reported in Saudi Arabia and with a fatality rate of around 34% (6).

Though this SARS-CoV-2 originated in Wuhan city of China in December, 2019 with a pneumonia like symptoms among patients, but this deadly virus rapidly spread to other parts of the world and causing serious illness among individuals especially older persons or persons with co-morbid conditions. In March 11, 2020, WHO declared this viral disease a global pandemic due to its very higher rate of human to human transmission and associated mortality (7,8). The deadly contagion already spread to almost more than 200 countries and territories,

causing infection of more than 24,021,218 people worldwide and with a mortality of more than 821,462 individuals (Table 1) in the last few months only. So, from this data it can be easily stated that this newest member of coronavirus family is the deadliest one and unfortunately, till date, there is no effective and scientifically approved antiviral drug or vaccine is available to minimize the spreading of this deadly contagion. So, in absence of any proper vaccine or other antiviral drugs, there are no alternatives left for scientists and health personnel other than repurposing various other existing antiviral drugs to battle against this deadly pathogen (9). So, repurposing of existing antiviral drug could be a plausible substitute to counter this deadly contagion, since the time is very limited and establishment of novel vaccine would require a longer time. So, one of these drugs, is remdesivir, a nucleotide analogue (10). It is imperative to note that this particular drug is already proved to be effective against other viral diseases including Ebola (10,11), Nipah (12–14), and also SARS CoV and MERS CoV (15). It has also been shown by different studies that this nucleotide analogue, remdesivir could be helpful for to minimize the degree of pathogenicity caused by SARS-CoV-2 to some extent. So, a huge deal of scientific studies and an array of clinical trials are currently underway to evaluate the fruitfulness of this particular molecule around the globe. Some countries, also approved this drug in an emergency basis (Table 2) reflecting the urgency of the situation of finding a suitable cure for this deadly disease. One of these countries is USA, and USFDA also approved this drug for treatment COVID 19 on an emergency basis.

In conclusion, we would like to inform that our main objective is to find out the underlying molecular mechanism of this particular molecule. Being a group of molecular biologists and bioinformatics researcher, we are only interested in the precise molecular mechanism of action of this particular molecule, though a lot of scientific research work needs to be done to get a proper and complete scientific explanation for this and we, the scientific community is still looking for that particular answer. But we would be highly delighted to note that our article is been cited by various prestigious research groups and this is a great honour and opportunity for us to answer this scientific question. We are always looking forward to give any scientific explanation needed to get a proper direction to this particular scientific endeavor.

Table 1. Different severe infection occurred time to time and their comparison with COVID-19

Sl No	Disease	Causative organism	Year of infection	Place of origin	No of infection	No of Death	Reference
1	Coronavirus Disease 2019 (COVID-19)	SARS-CoV-2	2019–2020 (27, August)	Wuhan, China	24,021,218 cases from 216 countries	821,462 deaths from 216 countries	(2)
2	Severe Acute Respiratory Syndrome (SARS)	SARS-CoV	2002–2003 (July)	Guangdong province, China	8,096 cases from 17 countries	774 deaths from 17 countries	(3)
3	Middle East Respiratory Syndrome (MERS)	MERS-CoV	2012–2010 (January)	Saudi Arabia	Total 2,519 cases reported in 27 countries	866 deaths reported in 27 countries	(4)

Table 2. List of countries approved by Remdesivir as emergency approval (Special Approval for Emergency) for COVID-19

Sl no	Name of the countries	Approval authorities/regulatory authorities	Reference
1	USA	USFDA	(16)
2	Japan	PMDA	(17)
3	India	DCGI	(18)

Conflict of Interest

No potential conflict of interest was declared by authors.

Funding

None.

Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.arcmed.2020.09.005>.

References

- Saha A, Sharma AR, Bhattacharya M, et al. Probable Molecular Mechanism of Remdesivir for the Treatment of COVID-19: need to Know More. Arch Med Res, 2020;. <https://doi.org/10.1016/j.arcmed.2020.05.001>.
- Organization WHO. Coronavirus disease (COVID-19): weekly epidemiological, update 1, 2020;. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>. Accessed August 27, 2020.
- WHO. Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003, 2003;. http://www.who.int/csr/sars/country/table2004_04_21/en/index.html. Accessed August 26, 2020.
- WHO. MERS situation update, January 2020, 2020;. <http://www.emro.who.int/health-topics/mers-cov/mers-outbreaks.html>. Accessed August 27, 2020.
- Organization WHO. Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003, 2003;. http://www.who.int/csr/sars/country/table2004_04_21/en/index.html. Accessed August 27, 2020.
- Zaki AM, Van Boheemen S, Bestebroer TM, et al. Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. N Engl J Med 2012;367:1814–1820.
- Chakraborty C, Sharma A, Sharma G, et al. SARS-CoV-2 causing pneumonia-associated respiratory disorder (COVID-19): diagnostic and proposed therapeutic options. Eur Rev Med Pharmacol Sci 2020;24:4016–4026.
- Chakraborty C, Sharma AR, Bhattacharya M, et al. The 2019 novel coronavirus disease (COVID-19) pandemic: a zoonotic prospective. Asian Pac J Trop Med 2020;13:242.
- Saha RP, Sharma AR, Singh MK, et al. Repurposing drugs, ongoing vaccine, and new therapeutic development initiatives against COVID-19. Front Pharmacol 2020;11:1–33.
- Warren TK, Siegel D, Hui HC, et al. Discovery and synthesis of GS-5734, a phosphoramidate prodrug of a Pyrrolo [2,1-f][triazin 4 amino]

- Adenine C-Nucleoside (GS 5734) for the treatment of Ebola and emerging viruses. *J Med Chem* 2017;60:1648–1661.
11. Warren TK, Jordan R, Lo MK, et al. Therapeutic efficacy of the small molecule GS-5734 against Ebola virus in rhesus monkeys. *Nature* 2016;531:381–385.
 12. Jordan PC, Liu C, Raynaud P, et al. Initiation, extension, and termination of RNA synthesis by a paramyxovirus polymerase. *PLoS Pathogens* 2018;14:e1006889.
 13. Lo MK, Jordan R, Arvey A, et al. GS-5734 and its parent nucleoside analog inhibit Filo-, Pneumo-, and Paramyxoviruses. *Sci Rep* 2017;7: 43395.
 14. Lo MK, Feldmann F, Gary JM, et al. Remdesivir (GS-5734) protects African green monkeys from Nipah virus challenge. *Sci Transl Med* 2019;11:eaa9242.
 15. Agostini ML, Andres EL, Sims AC, et al. Coronavirus susceptibility to the antiviral remdesivir (GS-5734) is mediated by the viral polymerase and the proofreading exoribonuclease. *MBio* 2018;9:e00221-18.
 16. Hinton RDM. Letter is in response to your request that the Food and Drug Administration (FDA) issue an Emergency Use Authorization (EUA) for emergency use of remdesivir for the treatment of hospitalized 2019 coronavirus disease (COVID-19) patients., 2020. pp. 1–6. <https://www.fda.gov/media/137564/download>. Accessed August 27, 2020.
 17. Yasuhiro F. Special Approval for Emergency on Remdesivir for COVID-19, 2020;. <https://www.pmda.go.jp/english/int-activities/0004.pdf>. Accessed August 27, 2020.
 18. Hindustantimes. Covid-19: India Allows Emergency Use of Remdesivir, 2020;. <https://www.hindustantimes.com/india-news/dcgi-nod-for-emergency-use-of-remdesivir/story-JJ5156zen4IiiYvgRZaJ0N.html>. Accessed August 27, 2020.

ABINIT SAHA^a
 ASHISH RANJAN SHARMA^b
 MANOJIT BHATTACHARYA^c
 GARIMA SHARMA^d
 SANG-SOO LEE^b
 CHIRANJIB CHAKRABORTY^a

^a*Department of Biotechnology
 School of Life Science and Biotechnology
 Adamas University
 Kolkata, India*

^b*Institute for Skeletal Aging and Orthopedic Surgery
 Hallym University-Chuncheon Sacred Heart Hospital
 Chuncheon-si, Gangwon-do, Republic of Korea*

^c*Department of Zoology
 Fakir Mohan University*

VyasaVihar, Balasore, Odisha, India

^d*Neuropsychopharmacology and Toxicology Program
 College of Pharmacy
 Kangwon National University
 Kangwon, Republic of Korea*

Address reprint requests to: Chiranjib Chakraborty, Prof., PhD, Department of Biotechnology, School of Life Science and Biotechnology, Adamas University, Barasat-Barrackpore, Rd, Jagannathpur, Kolkata, West Bengal 700126, India; Phone: +91-9871608125; E-mail: drchiranjib@yahoo.com

Received for publication August 27, 2020; accepted September 4, 2020 (ARCMED_2020_1576).