



ISSN : 0973-7057

Int. Database Index: 616 www.mjl.clarivate.com

The coronavirus disease COVID-19: Its origin, transmission, diversity, symptoms, effect and potential drug

Asha Ram Meena^{**}, Manju Sakhuniya^a & Sampat Ram Meena^b

^aDepartment of Zoology, University College of Science, MLSU, Udaipur, Rajasthan, India

^bDepartment of Zoology, Shri Govind Guru Govt. College, Banswara, Rajasthan, India

Received : 06th June, 2021 ; Revised : 08th July, 2021

Abstract- The Covid disease 19 (COVID-19) is an exceptionally communicable and pathogenic viral disease brought about by extreme intense respiratory disorder covid-2 (SARS Cov-2) which arose in Wuhan, China and spread far and wide. The transmission connection of starting point and moving to people not known, in any case, the quick human to human transfer has been affirmed broadly. This infection is part of Beta Coronavirus category, a similar to the 2003 serious intense respiratory disorder Covid (SARS CoV) and for the comparability it was named SARS Cov2. Due to the absence of enlisted clinical treatment or antibodies, countless doctors and researchers are examining recently utilized clinical medications for COVID-19- treatment. In the current reviews, we expect to give an outline of the CoVs origin, spread and diversity effect of Covid-19 on the organs and prevention and treatment with a focus on SARS- CoV-2.

Key words: COVID-19, SARS-Cov-2, Coronavirus, origin

INTRODUCTION

On 30 January 2020, the world health organization proclaimed the extreme intense respiratory condition covid-2 incident as disaster crisis of global concern¹. The coronavirus disease 2019 (Covid-19) was first designated in patients with acute respiratory disease coronavirus-2 (SARS-CoV-2)^{2,3}. Patients with COVID-19 and sepsis are considered the most disparaging of all. The goings with multiorgan brokenness results as an outcome of dysregulated has reaction to contamination. Indications of organ brokenness incorporate serious dyspnea, low oxygen immersion, decreased pee yield, tachycardia,

hypotension, cold limits, skin mottling, and changed mentation⁴. A new report by Johnston⁵ affirmed the huge and unnoticed openness of the endoscopist's face to possibly irresistible biologic examples during endoscopy. Endoscopy techniques request short actual separation from patients to personnel, and as indicated by studies performed during the worldwide SARS episode of 2003, drops from contaminated patients could contact people located⁶ feet (around 1.83 meters) or more from the source. Most of these reports need clinical pictures, because of well being concerns⁷ and they do not depict many patients in clinic settings. In India, the first case of the COVID-19 was reported on 30 January, 2020 and as of 8 November, a total of 84,98,209 positive cases leading to 12, 6006 deaths were identified.

*Corresponding author :

Phone : 6375778159

E-mail : meena05ar@gmail.com

ORIGIN AND SPREAD

Instance of first coronavirus (COVID-19) was seen in the Wuhan city of China. Wuhan, Hubei territory of China is considered as the origin for the life threatening viral pandemic of novel COVID-19⁸. China informed the flare up of COVID-19 to WHO on December. 31, 2019 and on January 7, 2020 it was discovered that covid has the > 95% with the bat covid⁹. The transmission of a microorganism from wild creatures to people is named zoonosis. The fundamental elements in a zoonotic infection are the microbe which can be a bacterium, protozoan or infection (SARS-CoV-2 in the event of Covid-19) and the host. The repository have (otherwise called regular, hereditary or support have) is one in which the irresistible specialists' living space for years or many years, without generally being pathogenic, is in a nice, steady and long haul relationship. Bats are considered as the supply has for CoVs and the infections can't vanish or diminish from their long-lasting dwelling repositories, the bats. The middle host fills in as a transient or speakers have which becomes tainted by the CoVs previously or while getting acquainted with the human populace. The infection duplicates in the middle of the road have which goes about as a hotspot for the zoonotic beginning of disease in the human populace. Along these lines, the infection can cause a disease in people from either its supply have straight forwardly or through the different moderate hosts.¹⁰ In 2001 the samples were isolated from the healthy person of Hong Kong and the molecular evaluation indicated 25% recurrence pace of antibodies against SARS-Covid. This proposed that SARS-covid might be circling in people prior to causing the people prior to causing the outbreak in 2003.¹¹ Later on, *Rhinolophus* bats were additionally found to have anti-SARS-Cov antibodies proposing the bats as a potential source of viral replication.¹² The Middle East respiratory syndrome (MERS) Covid previously rose in 2012 in Sandi Arabia.¹³ MERS-covid additionally realties to beta covid and they are infected camels as a zoonotic essential host.¹⁴ In an earlier study, MERS-Covid was additionally recognized in pipistrellus and perimyotis bats.¹⁵ Proffering initially bats.¹⁵ Proffering initially bats were considered the key host and transmitting medium of the virus.^{16,17} At first, a gathering of specialists suggested snakes to be the conceivable host notwithstanding, after genomic comparable its discoveries of novel covid bat viruses

supported the explanation that not winds yet no, one but bat could be the key repositories.^{18,19}

CORONA VIRUSES DIVERSITY

CoVs are zoonotic microorganisms starting in creatures that can be communicated to people through direct contact. All CoVs that caused plagues (Counting COVID-19) are accepted to be initiated in bats. Bats are hosts of numerous covids.^{20,21} The vast majority of the early detailed cases have been in that market, which was shut later by the Chinese power. Transformative investigation of COVID-19 infection uncovered that it is generally like that bats SARS-like CoV2. In reviews, the majority of the logical report accepts that SARS-2 began in bats and recent to people through halfway creature have in the fish market.²² Additionally, these infections can cause other disease in the setting of network procured bacterial pneumonia.²³⁻²⁵ Utilizing sub molecular techniques, information about the part of these infections in the setting of pneumonia has accomplished critical progression.²⁶⁻²⁸

SARS-Cov-2 was discovered to be a positive sense, single abandoned RNA infection having a place with the family *Betacoronavirus*.²⁹⁻³¹ In view of the discoveries of genomic examinations and the presence of certain bats or bat droppings related with tainted materials on the lookout or encompassing area.³²

EFFECT OF COVID-19

The recent proposed instrument for SARS-Cov-2 passage in the cell is through angiotensin changing over compound-2 (ACE-2) receptor, which is found in the lungs, heart, gastro-intestinal tract and kidney. This specific activity component may recommend that more seasoned grownups have more serious threats for infections. The CDC report says that 63.1 percentages of grownups more than 60 years have hypertension, 38% of individuals 65 years have persistent renal illness and 26.08% of grownups more than 65 years have diabetes's.³³ Diabetes is one of the most notable and among the most risky metabolic ailment, put aside by on gowning provocative conditions inciting metabolic and vascular varieties from the standard which, hence impact the response towards of microorganism. Because of hyperglycemia and insulin opposition progressed glycation final result (AGES) are framed which, thus invigorate markets, promoting tissue inflammation.³⁴ Beside, type 2 diabetes mellitus (T2DM) is additionally connected with Diabetes is one of the

most notable and among the most risky metabolic ailment, put aside by on gowning provocative conditions inciting metabolic and vascular varieties from the standard which, hence impact the response towards of microorganism. Endothelial brokenness and upgraded platelet collection and actuations due to the days regulated balance among coagulation and fibronolysis; these reactions lead to hypertension and CODs.³⁵ On release from ICU, 33% of the patients have dysexecutive disorder comprising of carelessness, confusion or in a adequately coordinated development because of order.³⁶ A few patients who recuperate from covid-19 create psychological wellness issue to³⁷ on skin appearance of covid 19 are like those of other infections and constant incendiary sickness like skin inflammation, dermatitis, psoriasis and rosaceous. Vascular issue related with skin appearance can neurogenic, microthrombotic or resistant complex interceded. Of the patients with skin indications a lion's shares have inconsistant erythematoes rash.³⁸ On covid-19 complicate the management of patients on dialysis and with kidney transplantation.³⁹ In Britain about 15% of the patients who died had chronic kidney disease ACE2 receptors are present in kidney.⁴⁰ Fever and inflammation can cause hyper coagulability and impair fibrinolysis, cytokine interleukin-6 (IL-6) levels correlate with hyper coagulability and disease severity. Elevated anti phospholipids antibodies are associated with thrombosis.⁴¹ Fever and irritation can also hyper coagulability and it comprises of alveolar fibrin collection. Aviation on route irritation is available expanded slender poronusness cause alveolar and interstitial edema. Vascular angiogenesis is distinctive elements of covid-19.

SYMPTOMS

Symptoms of this infection resemble pneumonia. Power of SARS-Cov2 might be genetic moderate or serious depending on the strength of the safe arrangement of the tainted person. Specific examples in the majority of cases will in general reflection the logical improvement of the infection. In an extent that still can't seem to be known after around seven days, tainted individuals well being results have erratically disinvited as respiratory debilitated instantly failure weakened promptly. The life threatening respiratory failure situation and medical requirements of sepsis and septic shock should be taken seriously.⁴²

Patients with simple (mild to moderate) sickness by and large have signs that involve slight fever, parched neck,

sore throat, weakness, stomach hurts, respiratory aggravation and disquietude in spite of the fact that affirmed dyspnea in patients were a symptomatic.⁴³ Dangerous pneumonia fever starts by significant illness, respiratory gloom or hypoxia (SPO₂<90% in the room). Fever is steady with extra ordinary pneumonia.⁴⁴ The degree of hypoxia in a few types of ARDS is diverse.⁴⁵ The clinical portrayals of patients with SARS-CoV2 and sepsis are principally serious, manifestations (Cardiovascular issues for example outrageous dyspnea and hypoxemia, acidosis, changed mental state, strange heaving, proficient organ varieties) and indicators of multi-organ stun open as hyperbilirubin lab results.⁴⁶

PREVENTION & TREATMENT OF CORONAVIRUS

The WHO and comparative kinds of associations have made the accompanying wide rules: in every case clean hands with cleaner and water or liquor containing hand, bars; when hacking and wheezing, cover the nose and mouth individuals who have cold or individuals who have cold or influenza like side effects, utilize the viral and subsequent to utilizing it arrange consuming of covered food try not go to public places and groups; stop risky field contact or life correspondence don't bring the house; support the execution of orderliness measures to stay away from and supervise disease, especially in the emergency medicine divisions. Persistent intake more is valuable liquids.^{47,48} It is fundamentals to restrict human to human transmission to lesson auxiliary contaminations among close contacts and medical services laborer sand forestall transmission intensification occasions and further worldwide spread. In light of past experience of the executives of MERS and SARS disease, WHO has prescribed contamination control intercessions to diminish the overall danger dangerous of transmission of intense respiratory contaminations, incorporating intense respiratory disease regular hand washing particularly, after direct contact with sick individuals or their current circumstances and staying away from unprotected contact with vanch or wild animals. Also individuals with side effects of intensive respiratory disease should rehearse hack manners which is to look after distance, cover hacks and wheezes with dispensable tissues or dress, control rehearses are suggested in clinics, particularly in crisis divisions.⁵⁰ (WHO, 2020) Not with standing, this virus utilizes various systems other than neural mimidase

encourage its delivery out of the contaminated cell. Another ongoing investigation proposes that riba virin whenever joined with interferon Beta may be promising medication for hind race of SARS CoV-2 replication.⁴⁹ Albeit numerous medications have been accounted for show promising outcomes against SARS-CoV-2 none of these medications have picked up a lot of consideration drugs chloroquine (CQ) and Hydrochloroquinine (HCQ).^{50,51} An ongoing report found that a blend of remesivir and chloroquine restrained SARS CoV-2 in vitro.⁵²

CONCLUSION

The covid-19 pandemic postures an important warning to the global public health patterns. The increasing positive cases and mortality have put the global human community on inform most harmful conditions are possible. Until now, there are no encouraging clinical drugs or prevention strategies have been originated against covid-19. However the many doctors, researchers are working to develop efficient medical strategies to deal with covid-19. In the meanwhile researchers around the global are researching strongly to discover clinical treatment or vaccine for the COVID-19.

REFERENCES

1. **World Health Organization (WHO).** Novel coronavirus (2019-nCoV). Situation report. <https://www.who.int/docs/default-source/coronaviruse/situation-reports/202...> rel="noopener nofollow noopener" title="External link: <https://www.who.int/docs/default-source/coronaviruse/situation-reports/202...>"><https://www.who.int/docs/default-source/coronaviruse/situation-reports/202...>[accessed 9 February 2020].
2. **Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Cheng, Z. 2020.** Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*, **395(10223)**: 497-506.
3. **Zhou, P., Yang, X.-L., Wang, X.G., Hu, B., Zhang, L., Zhang, W., Si, R.H., Zhu, Y., Li, B., Huang, C.-L. 2020.** A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*. **579**: 270-273.
4. **Cascella, M., Rajnik, M., Cuomo, A., Dulebohn, SC., Napoli, RD. 2020.** Treasure Island, FL: StatPearls

Publishing; [Mar;2020]. Features, Evaluation and Treatment Coronavirus (COVID-19)

5. **Johnston,E.R., Habib-Bein, N., Dueker, J.M. 2019.** Risk of bacterial exposure to the endoscopists face during endoscopy *Gastrointest Endosc.* **89**: 818-824
6. **Wong,T.W., Lee,C.K., Tam,W. 2004.** Cluster of SARS among medical students exposed to single patient, Hong Kong *Emerg Infect Dis.* **10**: 269-276
7. **Fernandez Nieto, D., Ortega Quijano, D., Segurado Miravalles, G. 2020.** Comment on: Cutaneous manifestations in COVID 19: a first perspective. Safety concerns of clinical images and skin biopsies. *J Eur Acad Dermatol Venereol.* **10**:1111.
8. **Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X. 2020.** Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* **395**:497–506.
9. **Backer, J. A., Klinkenberg, D., Wallinga, J. 2020.** Incubation period of 2019 novel coronavirus (2019-nCoV) infections among travellers from Wuhan, China, 20–28 January 2020. *Eurosurveillance.* **25(5)**.
10. **Ye, Z.W., Yuan, S., Yuen, K.S., Fung, S.Y., Chan, C.P., Jin, D.Y. 2020.** Zoonotic origins of human coronaviruses. *Int J Biol Sci*; **16(10)**:1668-1697.
11. **Zheng, B. J., Guan, Y., Wong, K. H., Zhou, J., Wong, K.L., Young, B. W. Y. 2004.** SARS-related virus predating SARS outbreak, Hong Kong. *Emerg Infect Dis.* **10(2)**:176.
12. **Shi, Z., Hu, Z. 2008.** A review of studies on animal reservoirs of the SARS coronavirus. *Virus Res.* **133(1)**:74–87.
13. **Memish, Z.A., Zumla, A. I., Al-Hakeem, R. F., Al-Rabeeh, A.A., Stephens, G.M. 2013.** Family cluster of Middle East respiratory syndrome coronavirus infections. *N Engl J Med.* **368(26)**:2487–94.
14. **Paden, C., Yusof, M., Al Hammadi, Z., Queen, K., Tao, Y., Eltahir Y. 2018.** Zoonotic origin and transmission of Middle East respiratory syndrome coronavirus in the UAE. *Zoonoses Public Health.* **65(3)**:322–33.
15. **Annan, A., Baldwin, H.J., Corman, V.M., Klose, S.M., Owusu, M., Nkrumah, E. E. 2013.** Human

- betacoronavirus 2c EMC/2012-related viruses in bats, Ghana and Europe. *Emerg Infect Dis.* **19**(3):456.
16. Huynh, J., Li, S., Yount, B., Smith, A., Sturges, L., Olsen, J. C. 2012. Evidence supporting a zoonotic origin of human coronavirus strain NL63. *J Virol.* **86** (23):12816–25.
 17. Lau, S. K., Li, K.S., Tsang, A.K., Lam, C.S., Ahmed, S., Chen, H. 2013. Genetic characterization of Betacoronavirus lineage C viruses in bats reveals marked sequence divergence in the spike protein of pipistrellus bat coronavirus HKU5 in Japanese pipistrelle: implications for the origin of the novel Middle East respiratory syndrome coronavirus. *J Virol.* **87**(15):8638–50.
 18. Lu, R., Zhao, X., Li, J., Niu, P., Yang, B., Wu, H. 2020. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet.* **6**(20):30251-8.
 19. Chan, J.F., Kok, K.H., Zhu, Z., Chu, H., To, K.K., Yuan, S. 2020. Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan. *Emerg Microbes Infect.* **9**:221–236.
 20. Ge, X.-Y., Li, J., Yang, X., Chmura, A., Zhu, G., Epstein, J.H., Mazet, J.K., Hu, B., Zhang, W., Peng, C. 2013. Isolation and characterization of a bat SARS-like coronavirus that uses the ACE2 receptor. *Nature.* **503**:535–538.
 21. Ithete, N., Stoffberg, S., Corman, V.M., Cottontail, V.M., Richards, L.R., Schoeman, C., Drosten, C., Drexler, J.F., Preiser, W. 2013. Close relative of human middle east respiratory syndrome coronavirus in Bat, South Africa. *Emerg.Infect.Dis.* **19**:1697-1699.
 22. Lu, S., Lin, J., Zhang, Z. 2020. Alert for non respiratory symptoms of Coronavirus Disease 2019 (COVID 19) patients in epidemic period: a case report of familial cluster with three asymptomatic COVID 19 patients. *J Med Virol.* **10**:1002.
 23. Chou, C.C., Shen, C.F., Chen, S.J., Chen, H.M., Wang, Y.C., Chang, W.S. 2019. Recommendations and guidelines for the treatment of pneumonia in Taiwan. *J Microbiol Immunol Infect.* **52**:172–199.
 24. Lee, J.Y., Yang, P.C., Chang, C., Lin, I.T., Ko, W.C., Cia, C.T. 2019. Community-acquired adenoviral and pneumococcal pneumonia complicated by pulmonary aspergillosis in an immunocompetent adult. *J Microbiol Immunol Infect.* **52**:838–839.
 25. Su, I.C., Lee, K.L., Liu, H.Y., Chuang, H.C., Chen, L.Y., Lee, Y.J. 2019. Severe community-acquired pneumonia due to *Pseudomonas aeruginosa* coinfection in an influenza A(H1N1)pdm09 patient. *J Microbiol Immunol Infect.* **52**:365–366.
 26. Hung, H.M., Yang, S.L., Chen, C.J., Chiu, C.H., Kuo, C.Y., Huang, K.A. 2019. Molecular epidemiology and clinical features of rhinovirus infections among hospitalized patients in a medical center in Taiwan. *J Microbiol Immunol Infect.* **52**:233–241.
 27. Lee, S.H., Ruan, S.Y., Pan, S.C., Lee, T.F., Chien, J.Y., Hsueh, P.R. 2019. Performance of a multiplex PCR pneumonia panel for the identification of respiratory pathogens and the main determinants of resistance from the lower respiratory tract specimens of adult patients in intensive care units. *J Microbiol Immunol Infect.* **52**:920–928.
 28. Lin, G.L., Lu, C.Y., Chen, J.M., Lee, P.I., Ho, S.Y., Weng, K.C. 2019. Molecular epidemiology and clinical features of adenovirus infection in Taiwanese children, 2014. *Journal of Microbiol Immunol Infect.* **52**:215–224.
 29. Chan, J.F., Yuan, S, Kok, K.H. 2020. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person to person transmission: a study of a family cluster. *Lancet.* **395**:514-23.
 30. Lu, R., Zhao, X., Li, J., Niu, P., Yang, B., Wu, H., Wang, W., Song, H., Huang, B., Zhu, N. 2020. Genomic characterisation and epidemiology of 2019 novel coronavirus: Implications for virus origins and receptor binding. *Lancet.* **395**: 565–574.
 31. Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J. 2020. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med.* doi: 10.1056/NEJMoa2001017.
 32. Jiang, S., Du, L., Shi, Z. 2020. An emerging coronavirus causing pneumonia outbreak in Wuhan, China: calling for developing therapeutic and

- prophylactic strategies. *Emerg Microbes Infect.* **9**:275–277.
33. **CDC COVID-19 Response Team. 2020.** Severe outcomes among patients with Coronavirus Disease 2019 (COVID-19) - United States, February 12-March 16, 2020. *Morb Mortal Wkly Rep.* **69(12)**: 343-346.
34. **Knapp S. 2013.** Diabetes and infection: is there a link?—A mini-review. *Gerontology.* **59(02)**: 99-104.
35. **Petrie, J. R., Guzik, T. J., Touyz, R. M. 2018.** Diabetes, hypertension, and cardiovascular disease: clinical insights and vascular mechanisms. *Can J Cardiol* **34(05)**: 575-584.
36. **Helms, J., Kremer, S., Merdji, H. 2020.** Neurologic features in severe SARS-CoV-2 infection. *N Engl J Med.* **382**:2268-2270.
37. **Pfefferbaum B, North C. 2020.** Mental health and the Covid-19 pandemic. *N Engl J Med.* **10**:1056/NEJMp2008017
38. **Recalcati, S. 2020.** Cutaneous manifestations in COVID 19: a first perspective. *J Eur Acad Dermatol.* **34**:e212-e213.
39. **Alberici, F., Delbarba, E., Manenti, C. 2020.** Management of patients on dialysis and with kidney transplantation during the SARS-CoV-2 (COVID-19) pandemic in Brescia, Italy. *Kidney Int Rep.***5**:580-585.
40. **Puelles, V., Lütgehetmann, M., Lindenmeyer, M. 2020.** Multiorgan and renal tropism of SARS-CoV-2. *N Engl J Med.* **10**.1056/NEJMc2011400. *Diabetes Metab Syndr Clin Res Rev.* **14**:661-4.
41. **Zhang, Y., Xiao, M., Zhang, S. 2020.** Coagulopathy and antiphospholipid antibodies in patients with Covid-19. *N Engl J Med.* **382**:e38.
42. **Singh, R. P., Javaid, M., Haleem, A. 2020.** Internet of things (IoT) applications to fight against COVID-19 pandemic. *Diabetes Metab Syndr Clin Res Rev.* **14**:521-4.
43. **Singh, R.P., Javaid, M., Kataria, R. 2020.** Significant applications of virtual reality for COVID-19 pandemic. *Diabetes Metab Syndr Clin Res Rev.* **14**:661-4.
44. **Johani, S. A., Hajeer, A. H. 2016.** MERS-CoV diagnosis: an update. *J. Inf. Public Health.* **9**:216-9.
45. **Liu, J., Cao, R., Xu, M., Wang, X., Zhang, H., Hu, H., Li, Y., Hu, Z., Zhong, W., Wang, M. 2020.** Hydroxychloroquine, a less toxic derivative of chloroquine, is effective in inhibiting SARS-CoV-2 infection in vitro. *Cell Discov.* **6**:1–4.
46. **World Health Organization. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV).** Available from URL: <https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-me...> rel="noopener nofollow noopener" title="External link: <https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-me...>"><https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-me...>) (accessed March 2020).
47. **Lechien, J.R., Chiesa-Estomba, C. M., De Siaty, D.R. 2020.** Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus disease (COVID-19): a multicenter European study. *Eur Arch Oto-Rhino-L.* **6**:1-11.
48. **Fan, J., Liu, X., Pan, W. 2020.** Epidemiology of 2019 Novel Coronavirus Disease-19 in Gansu Province, China, 2020. *Emerg Infect Dis.* **26**:1257-65.
49. **Zhang, L. Liu, Y. 2020.** Potential interventions for novel coronavirus in China: A systematic review. *J. Med. Virol.* **92**: 479–490.
50. **Gautret, P., Lagier, J.-C., Parola, P., Hoang, V.T., Meddeb, L., Mailhe, M., Doudier, B., Courjon, J., Giordanengo, V., Vieira, V.E. 2020.** Hydroxy chloroquine and azithromycin as a treatment of COVID-19: Results of an open-label non-randomized clinical trial. *Int. J. Antimicrob. Agents,* 105949.
51. **Colson, P., Rolain, J.-M., Lagier, J.-C., Brouqui, P., Raoult, D. 2020.** Chloroquine and hydroxy chloroquine as available weapons to fight COVID-19. *Int. J. Antimicrob. Agents.* **55**:105932.
52. **Wang, M., Cao, R., Zhang, L., Yang, X., Liu, J., Xu, M., Shi, Z., Hu, Z., Zhong, W., Xiao, G. 2020.** Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. *Cell Res.***30**: 269–271.
