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Review on

SARS-CoV-2: AN EMERGING GLOBAL THREAT
Prevention & Control

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BACKGROUND

On December 2019, several cases of pneumonia caused by a novel ß-coronavirus identified were reported in Wuhan, China. The virus was named SARS-CoV-2 and the related disease COVID-19. On 25th May of 2020, the COVID-19 had affected more than 200 countries and territories, with 5.267.419 infections and 341.155 deceased[1].

INTRODUCTION [2]

SARS-CoV-2 (Figure 1) is an unsegmented single-stranded RNA virus. It belongs to *Coronaviridae* family, specifically to *Betacoronavirus* genus. After SARS-CoV and MERS-CoV, SARS-CoV-2 is the third coronavirus that causes a severe disease among human population in 21st century. The origin is unknown but genomic analyses indicate that the bat could be the natural host and the pangolin the intermediate. SARS-CoV-2 uses the angiotensin-converting enzyme 2 (ACE2) as a receptor to enter target cells, as well as SARS-CoV. To recognize the cell receptor, the virus uses the spike (S) protein, a surface protein represented in red Figure 1.

The virus is transmitted human-to-human through droplets, aerosols, respiratory secretions and faeces. The most common symptoms include fever, cough, fatigue, sputum production and shortness of breath. The disease can negatively evolves to pneumonia and acute respiratory distress syndrome. The most susceptible population to the disease are the elderly and/or people with previous chronic pathologies.

OBJECTIVE

The aim of this study is to review the main prophylactic strategies and the most promising treatments and vaccines that are being researched, and conclude how we can prepare for another similar situation in the future.

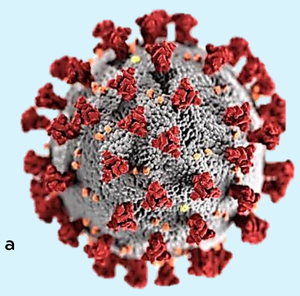

Figure 1. Illustration of a SARS-CoV-2 virion[3].

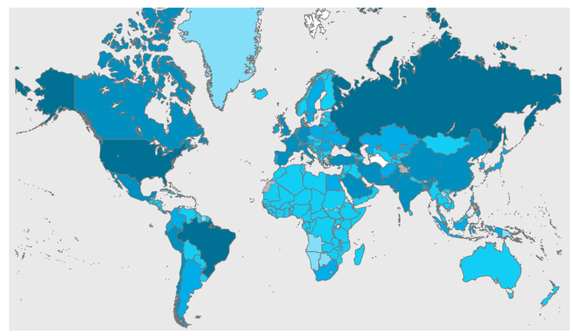

Figure 2. Distribution of COVID-19 by countries on 30th May of 2020[1].

METHODOLOGY

Bibliographic research based on databases as PubMed or Google scholar as well as official organizations webs as WHO.

PubMed — World Health Organization

PREVENTION & CONTROL STRATEGIES

- Minimize social contact
- Use of personal protective equipment
- Environment disinfection
- Epidemiological surveillance networks

WHO has elaborated prevention manuals with some recommendations to slow down disease transmission for the population[1]

DIAGNOSIS[4]

RT-PCR	Detect viral RNA from nasopharyngeal sample	+ High specificity and sensibility - False positives and negatives - Slow diagnosis - Lack of reagents
IgM and IgG detection	Measure the host immune response	+ Quick test + Seroprevalence - False positives and negatives - Less specificity than RT-PCR

TREATMENTS [6]

Today, there is no SARS-CoV-2 treatment that has been proven to be effective in clinical trials. The need to find such treatment is of utmost importance since a vaccine is not expected at least for one year. In Table 1, the most promising candidates for the treatment of COVID-19.

THERAPEUTIC CANDIDATES	TARGET DISEASE	TYPE OF DRUG	ACTION MODE	STATUS FOR COVID-19
Lopinavir/ritonavir	HIV, SARS, MERS	Protease inhibitors	Inhibiting protease for protein cleavage, resulting in non-infectious viral particles	Clinical trials for COVID-19
Chloroquine/Hydroxychloroquine	Malaria, autoimmune diseases	9-aminoquinolin	Increasing endosomal pH, immunomodulating, autophagy inhibitors, interfering with the ACE2 glycosylation	Clinical trials for COVID-19
Remdesivir (GS-5724)	Ebola	Nucleotide analogue prodrug	Interfering with virus post-entry: inhibits viral RNA synthesis targeting RdRp	Phase III clinical trials for COVID-19
Favipiravir (T-705)	Influenza A (H1N1), Ebola, yellow fever, Chikungunya, norovirus and enterovirus	Guanine analogue	Interfering with virus post-entry: inhibits viral RNA synthesis targeting RdRp	Clinical trials for COVID-19
Tocilizumab	Cytokine release syndrome, rheumatoid arthritis	Recombinant humanized monoclonal antibody	IL-6 receptor antagonist: blocks the cytokine storm release	Clinical trials for COVID-19

Table 1. List of therapeutic candidates for COVID-19 treatment and their features.

CANDIDATE VACCINES [6]

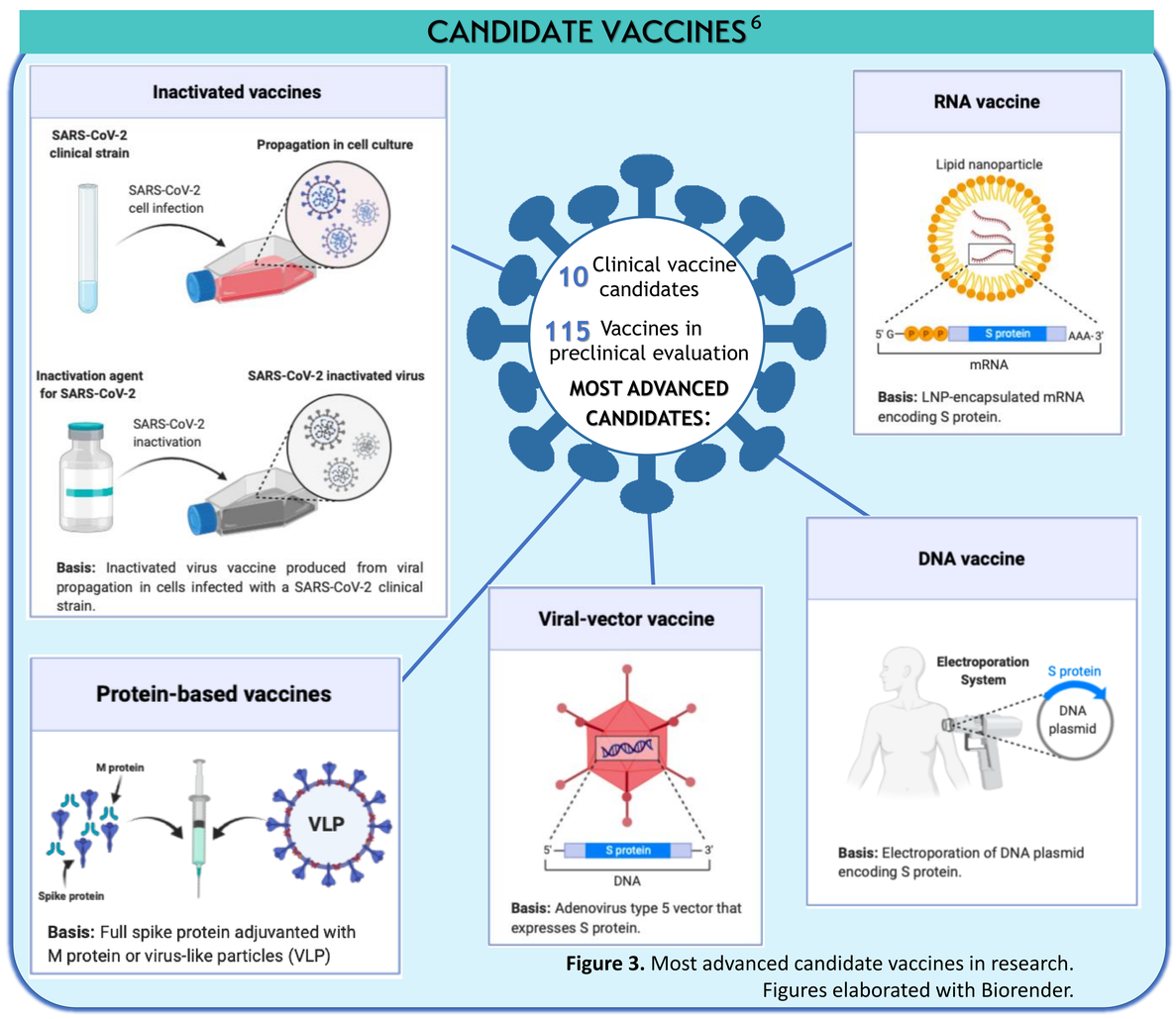

Figure 3. Most advanced candidate vaccines in research. Figures elaborated with Biorender.

CONCLUSIONS

There has been a great breakthrough in SARS-CoV-2 research these last few months. The best prevention to reduce the transmission of the virus for the moment is the social distancing, to control the personal and environmental hygiene and to intensify the epidemiological surveillance networks around the world. These measures will be crucial until a treatment or vaccine was developed. However, much research remains to be done on the SARS-CoV-2.

For the future, we should implement some measures to reduce the probability of zoonotic outbreaks:

- A greater investment in scientific research, specially in animal etiology.
- Normalize the high-risk pathogens study.
- Reduce direct contact with wildlife.
- Keep barriers among potential animals reservoirs of virus and the population.
- Outlawing the trafficking of wild animals.

We cannot discard another coronavirus outbreak in the future, so scientists suggest we should invest in the development of vaccine which confers immunity front others coronavirus.

REFERENCES: 1. WHO. World Health Organization. https://www.who.int/. 2. Wang, L., Wang, Y., Ye, D. & Liu, Q. Review of the 2019 novel coronavirus (SARS-CoV-2) based on current evidence. Int. J. Antimicrob. Agents 105948 (2020) doi:10.1016/j.ijantimicag.2020.105948. 3. Details - Public Health Image Library(PHIL). https://phil.cdc.gov/Details.aspx?pid=23312. 4. Sethuraman, N., Jeremiah, S. S. & Ryo, A. Interpreting Diagnostic Tests for SARS-CoV-2. JAMA (2020) doi:10.1001/jama.2020.8259. 5. Ahn, D.-G. et al. Current Status of Epidemiology, Diagnosis, Therapeutics, and Vaccines for Novel Coronavirus Disease 2019 (COVID-19). J. Microbiol. Biotechnol. 30, 313–324 (2020). 6. Draft landscape of COVID-19 candidate vaccines. https://www.who.int/who-documents-detail/draft-landscape-of-covid-19-candidate-vaccines.