

Mini Review of Effect of Temperature on SARS-CoV-2 and Drugs for COVID-19

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ABSTRACT

The novel virus known to cause COVID-19 belongs to coronavirus family. Previous study about this family shows seasonality behavior. They stop to infect human beings after few months. Researchers are assuming same trend for SARS-CoV-2. But we are not sure about this. Some drugs e.g. Remdesivir, Flavipiravir, HIV medicines, chloroquine, hydroxychloroquine are also tested in different countries on different number of patients. Some drugs proved to be beneficial but because of some limitations, we cannot use them publicly. A concept of about convalescent plasma therapy seems to reveal new door for the treatment of COVID-19.

Keywords: Seasonality, Remdesivir, Flavipiravir, Chloroquine, Hydroxychloroquine.

1. Introduction

SARS-CoV-2 is virus that belongs to coronavirus family. Many viruses are included in this family but seven viruses of this family are known to cause diseases in human beings. Out of seven, four cause mild cold. These are human coronavirus 229E, human coronavirus OC43, NL63, HKU1. Three coronaviruses are known to cause serious diseases. Severe acute respiratory syndrome coronavirus (SARS-CoV), Middle East respiratory syndrome-related coronavirus (MERS-CoV) and Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), previously known as 2019-nCoV or "novel coronavirus 2019". The disease caused by this virus is named as COVID-19.

Previous studies show that viruses of this family do subside in warmer months. They cause disease in human beings from October to April. These viruses can also known as seasonality viruses. But here our main concern is about SARS-CoV-2. We are not certain about the behavior of this virus in warmer environment. Whether this virus will show the behavior of seasonality or not? So, it is too early to say that this virus also subside in summer.

Due to pandemic in nature, this virus spread globally. Some people believe that this virus is temperature sensitive so it cannot infect countries with hot weather. Here is the list of 10 hot climate countries.

Saudi Arabia, Libya, Iraq, Iran, Algeria, Oman, Sudan, Somalia, India, Mexico. Almost all these countries reported the cases of SARS-CoV-2. Now a days (March, 2020) temperature of these countries ranging from 14 to 32 degree Celsius. Similarly, top cold weather countries; Ice land, Fin land, Green land, Russia, Canada, United states of America also reported the cases of SARS-CoV-2. Now a days (March, 2020) temperature of these countries ranging from 8 to 20 degree Celsius.

So we can say that SARS-CoV-2 can survive and infect humans in temperature between 8 degree to 30 degree Celsius. In simple words, we can say that this virus is viable up to 25 to 30 degree Celsius and 40- 50 % humidity for over 5 days if it is present over dry and smooth surfaces. At higher temperature e.g. 38 degree Celsius and relative humidity of about 95%, the viability of this virus may lose. Because of this reason, it is

predicted that this virus may lost his viability in coming months of summer e.g. June, July etc. But again, we are not sure about this. So, we have to prepare antiviral drug as soon as possible to save humanity.

2. Drugs for COVID-19

There is no specific drug or remedies tested for COVID-19. Supportive care help patients to fight against this disease. Drink plenty of liquids, juices. Take proper rest and sleep at least 8 hours a day. Use room humidifier to keep room humid above 80%. Take hot shower to help ease to sore throat and cough. Use hand sanitizer to wash hands. Some older drugs, for other diseases, seems to be giving positive outcomes. Much more work needs to be performed on this. These are all short-term strategies. We need some long-term strategy to combat with COVID-19. According to World Health Organization (WHO), Vaccine is the most effective way to prevent this disease. Vaccine formation for any disease is time taking process. Traditionally it could take decade or more for a new vaccine to go from design to approval. The process can be broken down into 6 phases.

- 1- *Vaccine design*
- 2- *Animal studies*
- 3- *Clinical trials (phase 1)*
- 4- *Clinical trials (phase 2)*
- 5- *Clinical trials (phase 3)*
- 6- *Regulatory approval*

Vaccine must be tested vigorously and confirmed safe by clinical trials before they can be used routinely on humans.

Microscopic study of SARS-CoV-2

Microscope explains the crown like projection over the surface of this family. Due to these projections we named this family CORONAVIRUS. In the process of developing vaccine, Scientists are looking towards these projections. These projections enable the virus to enter into the human cell where it can replicate and make copies of itself. These are actually spike proteins known as S proteins. Researcher suggests that these spike proteins could be viable vaccine in any coronavirus vaccine.

Previous SARS outbreak in China in 2002 – 2003, also have look of crown on its surface. The previous study about SARS outbreak helps researcher to start preparing vaccine against part of spike protein.

Nucleic acid vaccine

Many companies of this world are working on SARS-CoV-2 vaccine. They are trying to use different ways to stimulate immunity against SARS-CoV-2 in patients. Nucleic acid vaccine is novel type which is essentially very programmable type containing small piece of genetic code or DNA to act as an antigen. Coronavirus RNA can be used as genetic code. We took piece of genetic code for S protein and fuse it with fatty nanoparticles that can be injected into body.

Here is the list of some drugs that are tested on small level. Due to some limitations these, drugs are not used publicly.

Remdesivir

Experimental antiviral drug first prepared by biotech firm. This drug has been used in US, China, Italy on compassionate basis. Drug is not publicly approved but it can be applied on critically ill patients.

This drug is not specifically designed to destroy SARS-CoV-2. Simple mechanism of working this drug is to knock out some piece of machinery from virus e.g. RNA polymerase which virus usually used for replication. In past, remdesivir prove to be effective on human cells and mouse models. In spite of all these this drug is still under consideration and much more research will be needed to admit this drug for general treatment of SARS-CoV-2.

Flavipiravir

Antiviral drug called flavipiravir also known as Avigan. It is observed that patients who took flavipiravir, shorten the course of disease and get cure from COVID-19 after 4 days. And the patient who did not took flavipiravir, get cure after 11 days.

Clinical trials are performed in Wuhan and Shenzhen over 300 patients. This drugs target RNA viruses and the mechanism of action of this drug is same as that of remdesivir. It disrupts the pathway which helps these viruses to replicate inside the cells. This drug is not seems to be effective in patients showing severe symptoms.

HIV medicine

Some HIV medicines are also used to treat COVID-19 in China. These medicines are used in early days of SARS-CoV-2 outbreak just to fight against this virus. Results of this medicine show that adults with severe COVID-19 were not benefitted with this treatment so we can say that no clinical improvement is observed by this treatment.

Chloroquine

Chloroquine is a drug used against Malaria for around 70 years. This drug appears to block viruses from binding to human cells and getting inside to replicate. A letter to editor in journal nature on Feb 4,2020 showed chloroquine was effective in combating SARS-CoV-2. This improve success rate and shorten hospital stay.

Hydrochloroquine

This drug is also effective at inhibiting SARS-CoV-2. Hydrochloroquine derivatives are widely used in past to treat rheumatoid arthritis. But there is limitation to use hydroxyquinine. It can give headaches, diarrhea, rashes and muscles problem. In rare cases, it also effect heart muscles and result in heart failure.

Combination of hydroxychloroquine with antibiotic azithromycin

In France, experiment is performed on less number of patients and suggested that this combination may be effective.

But to date there is no clear indication that chloroquine and hydroxychloroquine are treatment options for COVID-19. Additional trials are needed to be performed to check the viable option for COVID-19 treatment.

Convalescent plasma therapy

On March 24, 2020 US FDA announced that convalescent plasma may be used to treat very serious patients of COVID-19. It is predicted that, in this therapy blood from recovered patient is taken.

As we know when virus enters into body, our body sends army cells e.g. white blood cells (WBCs) to fight against it. These WBCs release antibodies against that antigen in plasma. If patients recovered from COVID-19, they are likely to have antibodies against that virus in blood plasma. So, take portion of plasma of patient and infused it into ill patient. We hope that antibodies in plasma may stimulate the patients own immune system to bind and begin to destroy the virus. Previous outbreaks of MERS, HH1N1 influenza, SARS are also dealt with this therapy. So, we can predict that this therapy would be used to treat COVID-19.

3. Conclusion

SARS-CoV-2 belongs to coronavirus family due to his crown like look. Due to seasonality behavior, it is predicted that this virus also show subside behavior. But we are not sure about this. So, we have to prepare vaccine to combat with COVID-19. Researchers are trying different drugs, remedies but till to date, there is no clear treatment for COVID-19. Convalescent plasma therapy seems to be more effective to cure this.

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