A Glimpse on Possible Detection Tools and Vaccines for Mitigation and Management of COVID-19

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Abstract. The world is made up of all kinds of living organisms which also includes microorganisms like bacteria, virus and fungus. One of them coronavirus was rare one but in 2019, a new strain called SARS-CoV-2 was discovered in Wuhan, China which was quite similar to SARS-CoV Virus. Days went and the world was in pandemic. The virus, subsequently named COVID-19 virus was affecting all over the world and lives were in peril. People got aware of its symptoms and precautions declared by World Health Organization (WHO). COVID-19 was mainly diagnosed by RT-PCR and antigen tests. After crossing many hurdles, scientists developed vaccines and some of them like Comirnaty, mRNA-1273 and AstraZeneca vaccines got approved by FDA and it was developed by many premier institutes. So far, at least 5.9 million people in United States have received their first dosage and other vaccines are under clinical trials. This review provides a glimpse on various aspects related to COVID-19 including diagnostic tools and vaccination

Keywords: SARS-CoV-2; COVID-19; Genotype; Phenotype; Symptoms; Diagnosis; Vaccines

1. Introduction

In this great planet called earth, getting infected from microbes like bacteria and virus or may be fungi which may also be fatal has become a part of our lives. Everyone at least once in lifetime will be affected by coronavirus which was only affecting animals and rarely in humans which was SARS-CoV virus during 2002-2003 [1]. Unfortunately, a new strain from Wuhan, China in 2019 is now rapidly spreading all over the world and it is called SARS-CoV-2 or COVID-19. Around 80% of people with this strain initially recovered without any treatment. The world health organization (WHO) declared pandemic on March 11, 2020

2. Aspects

2.1. phenotype and genotype

COVID-19 is spherically shaped that contains ssRNA with nucleoprotein within its capsid. It possesses around 26.4 – 31.7 kb RNA genomes with G+C contents from 32 % to 43%. It also contains ORF1ab spike envelope with N-terminal fragments within spike proteins. Coronavirus occurs in 5' to
3’ order [1]. Based on its phylogenetic and genomic structures, it belongs to genera beta coronavirus which is similar to SARS-CoV since its entry point is ACE2 receptor [1] [Fig.1]

Fig.1. Phenotype of COVID-19

2.2. COMPARISON BETWEEN SARS-CoV2, SARS-CoV and MERS-CoV

The intermolecular and intramolecular interactions involve 5’UTR and 3’UTR as their coding regions which is important for RNA-RNA interactions [2] At 5’ end, pblab is their first ORF of whole genome encoding non-structural proteins with size of 29844bp in SARS-CoV-2, 29751bp in SARS-CoV and 30119bp in MERS-CoV. In 3’ end of beta coronavirus, it was 1273aa in COVID-19, 21493aa in SARS-CoV and 1270aa in MERS-CoV.

Fig.2. Comparison between SARS, MERS and COVID-19

2.3. LIFE SPAN OF COVID-19 ON SURFACES

The coronaviruses can live on the surfaces for particular period of time depending on the type of surfaces. The viruses which in form of droplets lesser than five micrometers as aerosols can spread through air or touching the infected surfaces.

Table 1: Showing lifespan of coronavirus on different surfaces

| SURFACES    | DURATION ON    |
|-------------|----------------|
| Tissue paper| 3 hours        |
| Copper      | 4 hours        |
| Cardboard   | 24 hours       |
| Wood        | 2 days         |
| Fabrics     | 2 days         |
| Stainless steel | 2 – 3 days   |
2.4. Mode Of Transmission
Coronavirus is an airborne droplet disease which will be transmitted from one person to another person by sneezing or coughing and also by surface contamination. It is said that virus can stay in the air for up to 3 hours and if you breathe that air it get into your lungs, some studies shows that virus particles are also found in infected people stools, but it is not confirmed that it can spread through stools[3]. The most common mode of transmission is community spread where a normal person gets in contact with the sick person, it is reported that pets have also been tested with this new coronavirus strain which will be transmitted from an infected human being, There is no evidence that pets play a task in its spread.

2.5. Signs And Symptoms
A person can carry virus for 2 days or up to 2 weeks before you notice the symptoms. It includes shortness of breath, prolonged coughing, low grade fever, fatigue, shivering, sore throat, headache, body pain, loss of taste and smell, excessive drowsiness, persistent pressure in chest, and gastrointestinal symptoms such as diarhoea, vomiting, abdominal pain.[4]

2.6. Diagnosis
If a person observes any symptoms related to COVID-19 should isolate and be in quarantine for at least 14 days, currently there are main two types of diagnostic test such as RT-PCR test which detects virus’s genetic material and antigen test which detects specific proteins from the virus.[4]

| PROCEDURES | MOLECULAR TEST | ANTIGEN TEST | ANTIBODY TEST |
|------------|----------------|--------------|---------------|
| Names      | Diagnostic test, viral acid | Diagnostic test | Serological test, serology, blood test |
| Sampling method | Nasopharyngeal or throat swab | Nasal or nasopharyngeal swab | Finger stick or blood draw |
| Duration for results | Same day | 15 – 30 minutes | Same day or 1-3 days |
| Results | Diagnosis active coronavirus infection | Diagnosis active coronavirus infection | Shows if your have been infected by coronavirus in past |

2.7. Vaccinations
Normally, it is said that vaccines can be developed and completes its clinical trial with FDA approval within 10 – 12 years of time. Covid-19 is an emergency pandemic and people need vaccinations immediately. After so many trials, FDA approved some vaccines and it is developed by different institutes for different countries all over the world.[5]
Table 3: Approved vaccines and its developers.

| NAME                        | DEVELOPERS                  | VACCINE TYPE               |
|-----------------------------|-----------------------------|----------------------------|
| Comirnaty (BNT162b2)        | Pfizer, BioNTech, Fosun pharma | mRNA – based vaccine       |
| mRNA – 1273                 | Moderna, BARDA, NIAID       | mRNA – based vaccine       |
| CoronaVac                   | Sinovac                     | Inactivated vaccine        |
| AstraZeneca (AZD1222) / ChAdOxInCoV-19 | BARDA, OWS, COVISHIELD    | Adenovirus vaccine         |

- COMIRNATY (BNT162b2): It is nucleoside modified RNA formulated in lipid nanoparticles (LNP) which encodes optimized SARS-CoV2 full length spike protein antigen.
- mRNA 1273: Novel LNP encoding full length spike protein consists of proprietary ionizable lipid SM102.
- CoronaVac: Composed of formalin with alum adjuvant [6]
- AstraZeneca (ChAdOxInCoV-19 / AZD1222): A Recombinant, replication deficient, chimpanzee adenovirus vector producing in genetically modified human embryonic kidney HEK-293 cells. It is 62% to 90% effective after completion of dosage. It is now mainly developed in serum institute of technology [7][8].

3. Conclusions

All over the world, 92,920,418 COVID-19 cases occurred in which 1,990,134 died and 66,442,257 of them recovered. Cases are still increasing as of today. USA and India are one of the most affected countries by this new SARS-CoV-2 virus. The whole world had come to a standstill for some time and people could not travel from one country to another country. Now people have adapted a new normal by wearing masks, washing hands with alcohol-based hand wash or sanitizers and maintaining social distancing and gaining more knowledge about these coronaviruses. Our scientists and doctors are on duty to help us in all ways. Future remains still uncertain but promising for return to normalcy.

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