



SYNAPSE
THE ZOOLOGY SOCIETY
OF
MIRANDA HOUSE



PRESENTS

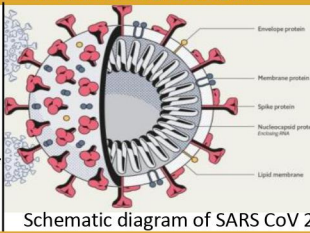
POSTER MAKING COMPETITION
ON THE TOPIC

**SCIENCE FIGHTS
CORONA**

Winning Entries

INTRODUCTION

- SARS CoV 2 stands for **Severe acute Respiratory Syndrome Coronavirus-2**
- Causal agent of COVID-19 (Coronavirus disease-19)
- Mode of transmission:- Respiratory droplets, Fomites.
- COVID-19 has been declared a pandemic by WHO.
- No drug has been developed yet and vaccines are under clinical trial. **Social distancing** is the key to prevent spread.



Structure of SARS CoV 2:-

- Lipid bilayer membrane
- Genetic material:- Single stranded RNA
- 4 structural proteins:- Spike (S), Envelope (E), Membrane (M) & Nucleocapsid (N) proteins.
- S protein (S1 & S2 subunit) essential for viral fusion, entry and transmission.

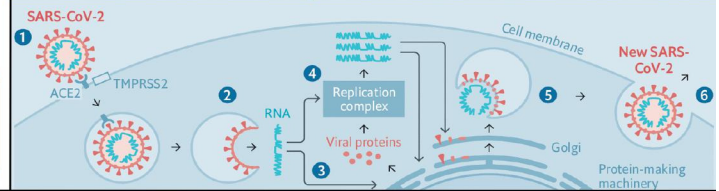
INFECTION & DISEASE

Viral attachment:-

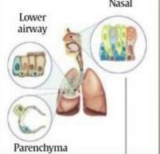
S1 subunit → N-Terminal domain (NTD)
 → Receptor binding domain (RBD)



Life cycle of SARS CoV 2

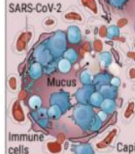


Point of entry-
Goblet & ciliated cells of nasal pathway.

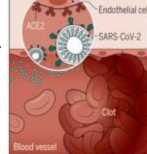


Impact

Lungs- Pneumonia
Permanent Scar tissue (Immune cells attack healthy cells).



Heart & blood vessels-
Blood clot, cardiac attack, inflammation



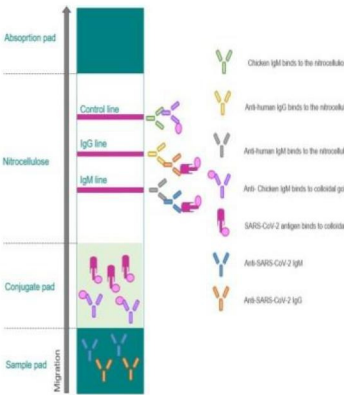
Brain- Stroke, seizure, inflammation
Eyes- Conjunctivitis, inflammation of eye membrane.

Kidney- Proteinuria, kidney failure
Intestine- Diarrhoea (High level of ACE2 receptors)

DIAGNOSIS

Rapid Antibody Testing

- Serological test
- The rapid test for diagnosis provides qualitative detection of IgG and/or IgM from human serum, whole blood or plasma.
- The test takes approximately 10-15 minutes.



Reverse transcription Polymerase Chain Reaction (RT-PCR)

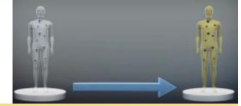
- Collection (Swab from nasal cavity/pharynx)
- Extraction of viral RNA
- RNA added to PCR mix (Reverse transcription)
- Amplification of Viral DNA
- Testing against controls

Test results			Clinical Significance
PCR	IgM	IgG	
+	-	-	Patient may be in the window period of infection.
+	+	-	Patient may be in the early stage of infection.
+	+	+	Patient is in the active phase of infection.
+	-	+	Patient may be in the late or recurrent stage of infection.
-	+	-	Patient may be in the early stage of infection.
-	-	+	Patient may have had a past infection, and has recovered.
-	+	+	Patient may be in the recovery stage of an infection

PREVENTION & TREATMENT

Convalescent Plasma Therapy

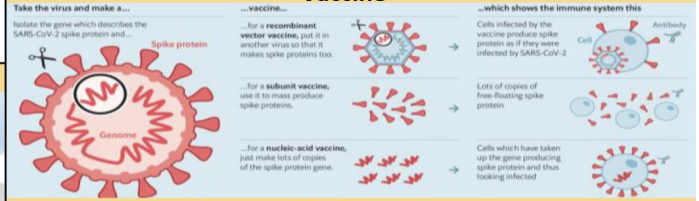
Based on the concept of **passive immunity**. Involves transfusion of the blood plasma of a recovered patient (housing antibodies) into another patient.



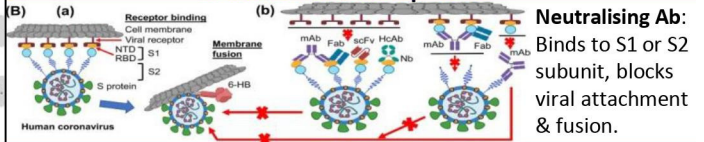
Drugs

- **Hydroxychloroquine:** Anti-malarial drug. Diminishes the **cytokine storm** (hyperinflammation) caused by the virus in severe cases.
- **Lopinavir + Ritonavir:** Anti-HIV drug
- **Remdesivir:** Antiviral drug for Ebola. An enzyme, RdRP, helps SARS CoV2 replicate inside the cell. Remdesivir inhibits RdRP.

Vaccine



Research & Development



SCIENCE FIGHTS RUMOURS

	Transmission	Drugs	Prevention	Recovery
Rumour	Through air	Hydroxychloroquine can cure COVID-19 Antibiotics can help treat COVID-19	Alcohol offers protection	One cannot recover from COVID-19
Science	Droplets (too heavy to travel farther than 1 m) & fomites	No drugs for COVID-19 yet, treatment is symptomatic only It is a viral disease, Antibiotics do not help	Hampers immune system, makes vulnerable to illness	Global Mortality rate- 3.4%; 80% show mild symptoms

REFERENCES

- <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
- <https://www.medicaldevice-network.com/features/types-of-covid-19-test-antibody-pcr-antigen/>
- **S.Jiang, L.Du & C.Hillyer.** Neutralizing antibodies against SARS CoV 2. 2020. Science & Society
- **WH. Chen & U. Strych.** SARS CoV2 vaccine pipeline. 2020. NCBI

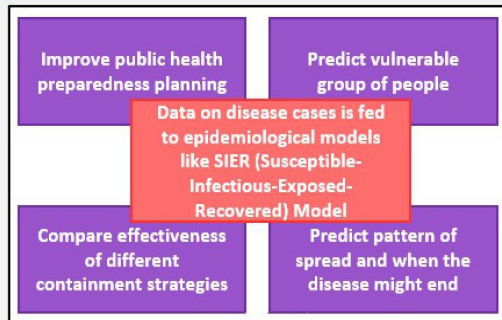
First - Srijan Singh, Samiksha Uniyal
B.sc(Hons.) Zoology, IIIrd Year, MH
Title- Science vs. SARS CoV 2

INTRODUCTION

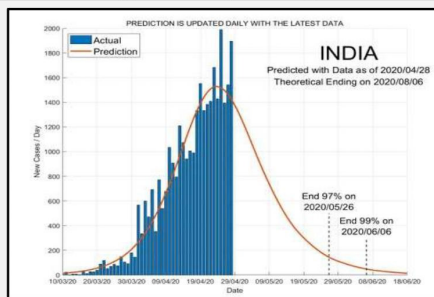
The first case of novel corona virus was first detected in Wuhan, China on 31st December 2019. The virus has been officially named as severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). The disease have been named as coronavirus disease 2019 (COVID 19). The disease has spread rapidly within China and throughout the world. World Health Organisation (WHO) declared the disease as pandemic on 11th March 2020. The common symptoms of COVID 19 include fever, tiredness, dry cough. Some people experience diarrhea, runny nose and sore throat. As of 29th April 2020, there are ~3.2 million confirmed cases of COVID 19 in the world and ~32 thousand confirmed cases of COVID 19 in India.

STRATEGIES USED TO UNDERSTAND THE DISEASE

Epidemiological Studies

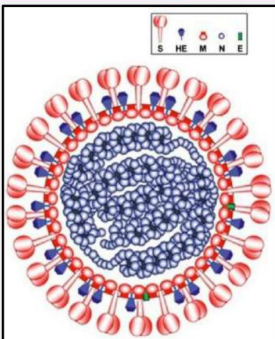


General Approach for Epidemiological Studies



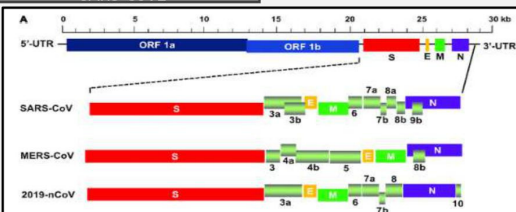
Prediction for ending of COVID 19 in India using SIR Model

Virological Studies



Schematic representation for SARS-CoV2

- Sequence of SARS-CoV-2 published.
- 2 sequences of this virus strains published by India.
- SARS-CoV-2 uses Angiotensin converting enzyme 2 as entry receptor.
- Crystal structure of main protease (M^{pro}) solved.



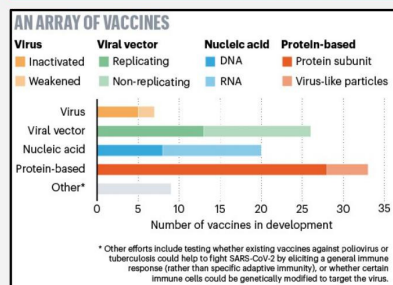
Comparison of genomes of different coronavirus

Diagnostic Tests

Table 1: Science behind different diagnostic tests for COVID 19

S.No.	Technique	Description
1	Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) based test	The sample is subjected to RT-PCR wherein the RNA of the virus is reverse transcribed to DNA. This DNA strand is amplified to get measurable result. Different kits use different genes of SARS-CoV-2
2	Enzyme Linked Immuno Sorbent Assay	The test is used to assess the presence of antibodies against virus in serum of people.

Vaccine Development



Eight Approaches for development of Vaccine for COVID 19

Some Vaccines under trail and development:

- Moderna
- Pfizer and BioNTech Vaccine
- Sanofi and Glaxosmith Kline Vaccine

Treatments in India

Current Treatment

Already available drugs for different diseases are being used by healthcare workers like chloroquinone and hydrochloroquinone

Treatment under Trial

Plasma therapy wherein the plasma of recovered patients is used to treat the infected people. The trails are giving positive results.

CONCLUSION

COVID 19 is spreading at a high rate throughout the world. The need of the hour is to flatten the curve that is reduce number of people getting infected at a given time. In these crucial times, its essential to follow social distancing. The scientific community throughout the world need to world as a team to understand the virus.

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- <https://ddi.sutd.edu.sg/when-will-covid19-end/>
- Dagur HS, Dhakar SS. Genome Organization of Covid-19 and Emerging Severe Acute Respiratory Syndrome Covid-19 Outbreak: A Pandemic. EJMO 2020;4(2):107-115
- Wang N, Shang J, Jiang S and Du L (2020) Subunit Vaccines Against Emerging Pathogenic Human Coronaviruses. Front. Microbiol. 11:298. doi: 10.3389/fmicb.2020.00298
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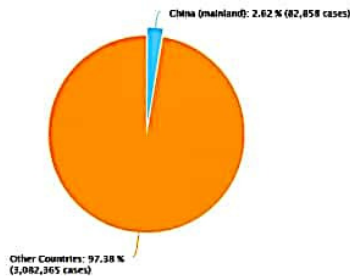
INTRODUCTION

The outbreak of Covid-19 in Wuhan, China, coughed out a new member of a known family of Corona virus into the world. SARS-CoV-2 is spherical and has proteins called spikes protruding out from its surface. The viral genes enter the host cell and produce more viruses. This zoonotic disease spreads via droplet infection. Its symptoms were initially reported to be restricted to lungs, but have now been shown to affect various vital organs.

STATISTICAL DATA

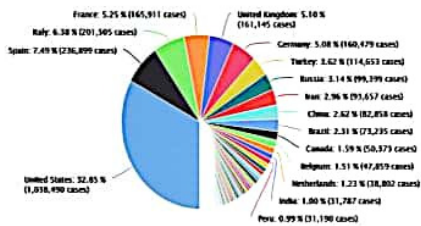
CASES

Distribution of cases worldwide



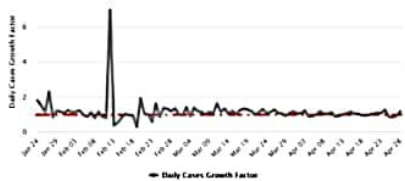
OUTSIDE OF CHINA

Distribution of Cases



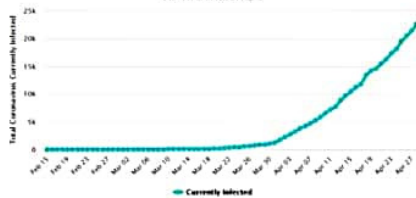
GROWTH FACTOR OF DAILY NEW CASES

Growth Factor
Daily Cases Growth Factor

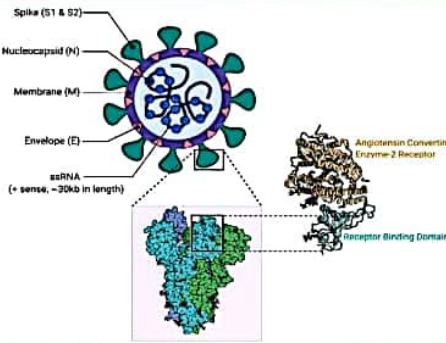


ACTIVE CASES IN INDIA

Active Cases
(Number of Infected People)

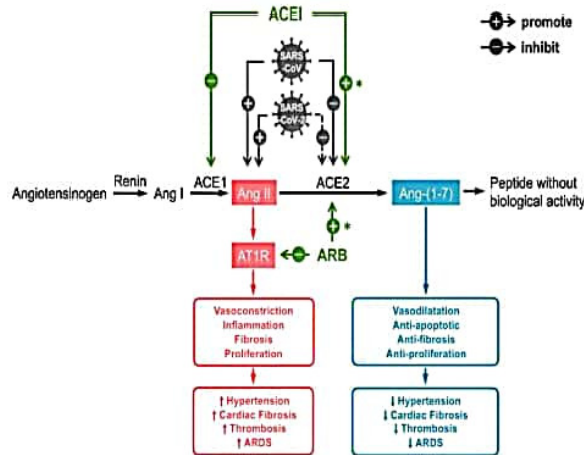


SARS-CoV-2 STRUCTURE

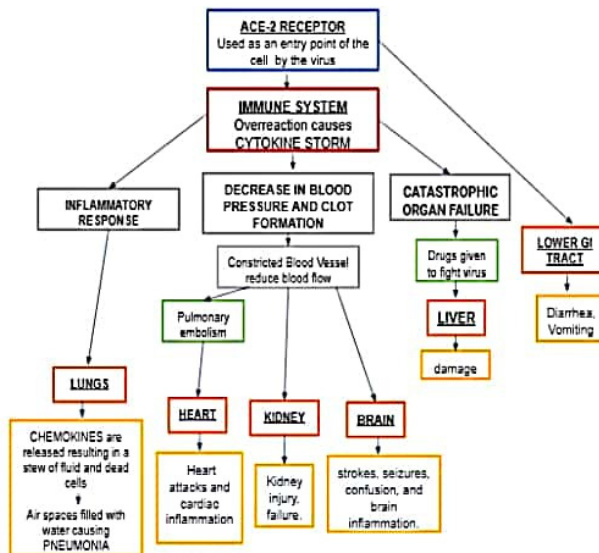


ANGIOTENSIN CONVERTING ENZYME-2

SARS-CoV-2 DISTURB THE Ang-II Ang-[1-7] BALANCE



EVENTS CAUSED BY VIRUS IN HUMAN BODY



SYMPTOMS

Novel Corona virus affects different people in different ways. Some develop mild to moderate symptoms while some show severe effects.

Common symptoms include:

- fever,
- tiredness,
- dry cough.

Other symptoms include:

- shortness of breath
- aches and pains
- sore throat
- and very few people will report diarrhoea, nausea or a runny nose.

TREATMENT

As of now there are no vaccines or therapies developed for the treatment of COVID-19. The affected patients are given symptom-based medicines to prevent life-threatening complications. Various organizations and countries are working towards developing a vaccine and medicines to prevent as well as treat COVID-19.

PREVENTION

- Washing hands regularly with soap and water, or cleaning them with alcohol-based hand rub.
- Practicing self isolation if unwell
- Avoid touching face.
- Covering mouth and nose when coughing or sneezing..
- Refraining from smoking and other activities that weaken the lungs.
- Practicing physical distancing.

REFERENCE

- <https://www.sciencemag.org/news/2020/04/how-does-coronavirus-kill-clinicians-trace-ferocious-rampage-through-body-brain-to-es#>
- <https://www.ahajournals.org/doi/10.1161/JAHA.120.016219>
- <https://www.worldometers.info/coronavirus/coronavirus-cases/>

Certificate of Appreciation- Khushi Srivastava, Haripriya Malviya

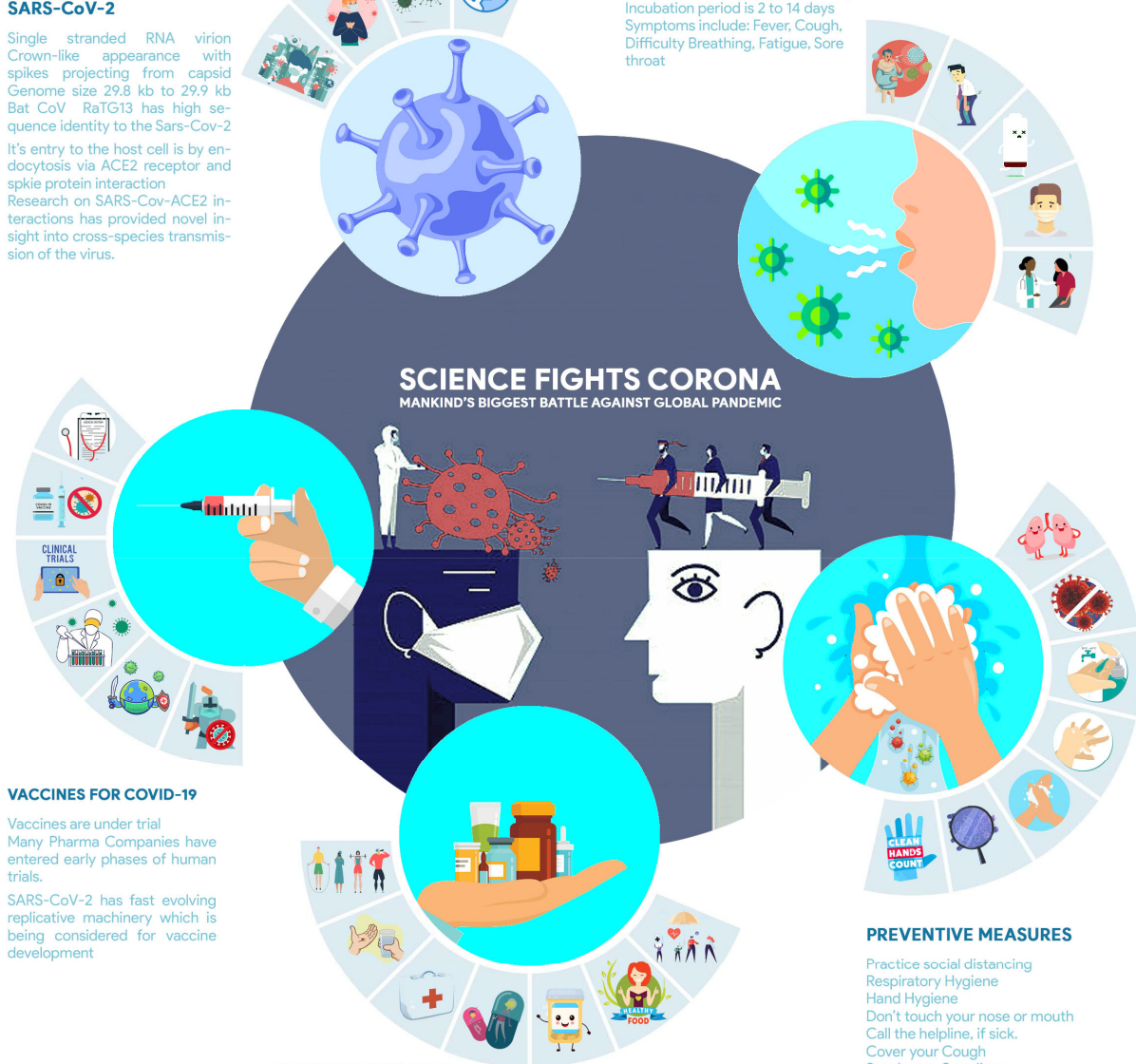
B.sc (Hons.) Zoology, IInd year, MH

Title- Understanding the rapid spread of corona virus inside human body

SARS-CoV-2

Single stranded RNA virion
 Crown-like appearance with spikes projecting from capsid
 Genome size 29.8 kb to 29.9 kb
 Bat CoV RaTG13 has high sequence identity to the Sars-Cov-2
 It's entry to the host cell is by endocytosis via ACE2 receptor and spike protein interaction
 Research on SARS-CoV-ACE2 interactions has provided novel insight into cross-species transmission of the virus.

TRANSMISSION, SYMPTOMS
 Transmission is via respiratory droplets
 Incubation period is 2 to 14 days
 Symptoms include: Fever, Cough, Difficulty Breathing, Fatigue, Sore throat



SCIENCE FIGHTS CORONA

MANKIND'S BIGGEST BATTLE AGAINST GLOBAL PANDEMIC

VACCINES FOR COVID-19

Vaccines are under trial
 Many Pharma Companies have entered early phases of human trials.

SARS-CoV-2 has fast evolving replicative machinery which is being considered for vaccine development

TESTING IS AVAILABLE: DIAGNOSTIC & SEROLOGICAL (ANTIBODY) TESTING

No treatment available yet
 Potential drugs- Broad spectrum anti-viral drugs e.g. Hydroxychloroquine, Chloroquine, Remdesivir are undergoing clinical trials.
 Remdesivir has 68% clinical improvement rate in USA, Europe, Japan

PREVENTIVE MEASURES

- Practice social distancing
- Respiratory Hygiene
- Hand Hygiene
- Don't touch your nose or mouth
- Call the helpline, if sick.
- Cover your Cough
- Stay home. Save lives
- Community Surveillance



High Risk Group
 -Older adults
 -Pregnant women



SARS-CoV-2 directly attacks immunity. It is due to protein-protein interaction between host and virus.



Society should be educated about microbes and their roles in the nature



Social Distancing - Coronavirus pushing people apart



People with diabetes, asthma, HIV, cardiovascular, lungs & kidney disease



Testing is done by swab test, blood test, sputum test etc.



Greater knowledge about microbes among people will lead to a healthy ecosystem.



Thank you the Frontline healthcare workers



SARS-CoV-2 manipulates multiple host proteins for its own survival.



Flatten the curve: NEED of the moment
 Worldwide efforts are being done to minimize corona threat.



Mother Nature heals amidst global lockdown.



World wide pandemic in these modern times throws a light on unending greed of humans.

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