

COVID-19 PANDEMIC

How the virus is detected & the science behind the replication process

TEAM YOKOVID

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STOPPING THE SPREAD

Importance of early detection.



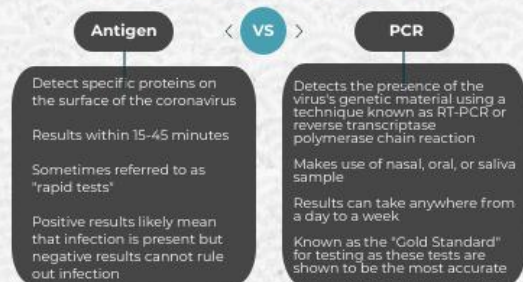
Early detection of COVID-19 has been an essential component of fighting the current pandemic as efficient testing procedures permit patients who are both asymptomatic and symptomatic with nearly immediate test results, enabling those who are diseased to take precautions and seek treatment if needed. Massive testing procedures across the globe have notified thousands of people to quarantine from their loved ones in order to keep those around them safe.



"I think I might have COVID-19, what test is the most accurate?"

There have been discrepancies with testing as no test is 100% accurate but some are arguably more accurate than others...

How is someone tested for COVID-19?



How does RT-PCR testing work?

1. The virus is first collected via saliva sample from nose or throat
2. Researchers break the virus releasing RNA
3. RT (reverse transcriptase) is used to convert viral RNA to double-stranded DNA
4. Using PCR, researchers are able to make millions of copies of converted viral DNA, this makes virus easier to detect
5. Fluorescent probe glows when it spots virus, signifying a positive test result

Does it matter if I get tested with an oropharyngeal or nasopharyngeal swab?

The nasopharyngeal mode of testing is arguably a more invasive test that many find uncomfortable while the oropharyngeal swab is much less invasive. Due to the sensitivity of the nasopharyngeal swab, a high number of false-positive test results have been observed, but the oropharyngeal swab has shown to produce several false-negative results. It is necessary for those who receive a negative result to continue to social distance and practice CDC guidelines, especially if presented with COVID-19 symptoms.

What about antibody testing?

Although developing an antibody test that is both sensitive and accurate can be challenging, this mode of testing has been important in identifying those with current antibodies in the bloodstream. Antibody tests are generally performed by detecting immunological response in a blood sample by using a protein engineered to bind to SARS-Co-V-2 antibodies

Antibodies bind to the virus, STOPPING the virus from replicating within our cells



Did you know that CTs have also been influential in the diagnosis of COVID-19?

The use of CT (computed tomography) discloses anatomic abnormalities of internal organs that would not appear on regular x-rays. Ground class opacification describes the "shades of grey" that can be observed in the CT scan of a diseased patient while a healthy patient's lungs appear as dark grey. These abnormal shades of grey should be taken seriously. Ground class opacification has been even been presented in scans of asymptomatic patients!

KEEP IN MIND

NO COVID TEST WILL EVER BE 100% ACCURATE, CONTINUE TO SOCIAL DISTANCE, WASH HANDS, AND STAY HOME WHEN SICK





How does replication work within SARS-CoV-2?

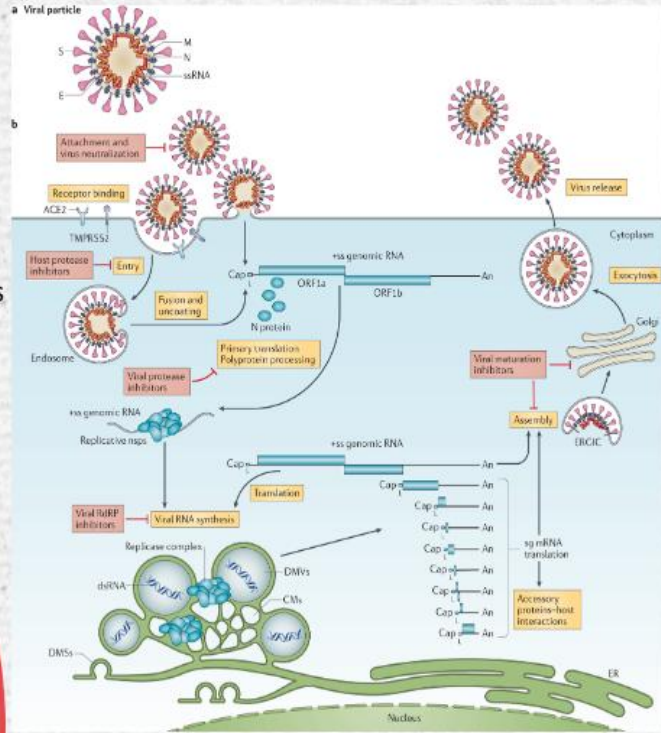
- Before replication there are steps that the virus must first take in sequence. The steps follows as: attachment, penetration, uncoating, replication, assembly, and release.

What happens during each step?

In attachment and penetration, the virus attaches itself to a host and injects its genetic material. During the uncoating, replication, and assembly process, the viral genetic material incorporates itself into the host cell's genetic material and induces it to replicate the viral genome and produce copies of the virus what happens in the inside is a very complicated process and it can be broken down into multiple steps with multiple factors. Specifically exploring replication, we can begin to see how it unfolds

How is the process being initiated?

The viral RNA will trigger the formation of the replicase gene which will encode two reading frames. To prepare a stable environment, non-structural proteins assemble a unit called the RNA Transcriptase Complex. Two negative strands of RNA are produced, sub genomic RNA and genomic RNA.

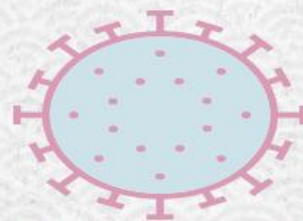
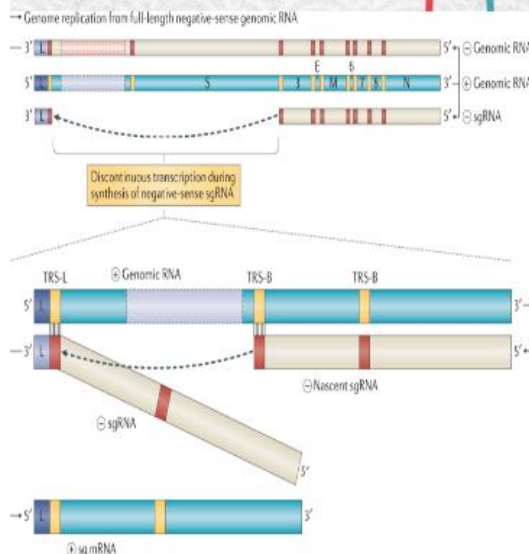


What is the purpose of the negative strands?

These negative strands serve as templates to produce positive genomic and sub genomic strands. The genomic RNA will be translating the cell's genetic information and the sub genomic RNA will contribute towards translating structural proteins such as spike (S), envelope (E), membrane (M) and nucleocapsid protein (N).

What happens to these Structural proteins?

After they are produced, they are confined within a component of the cell called the endoplasmic reticulum-golgi intermediate compartment. Within this compartment, the interaction of the structural proteins with the nucleocapsid forms small vesicles which will export the material out of the cell by a process called exocytosis.





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This poster is a part of our outreach initiative to inform the community about SARS-coV-2 and to thank them for all of the effort they put in to keep everyone safe. This poster will be reproduced in an informative brochure format which will be available to everyone to promote the learning and understanding of science in our community. Thank you all for all the effort you put in and we would love to have any feedback or questions about our poster!