Diagnosis: COVID

UNDERSTANDING COVID-19 DIAGNOSTIC TESTS AND HOW TO USE THEM

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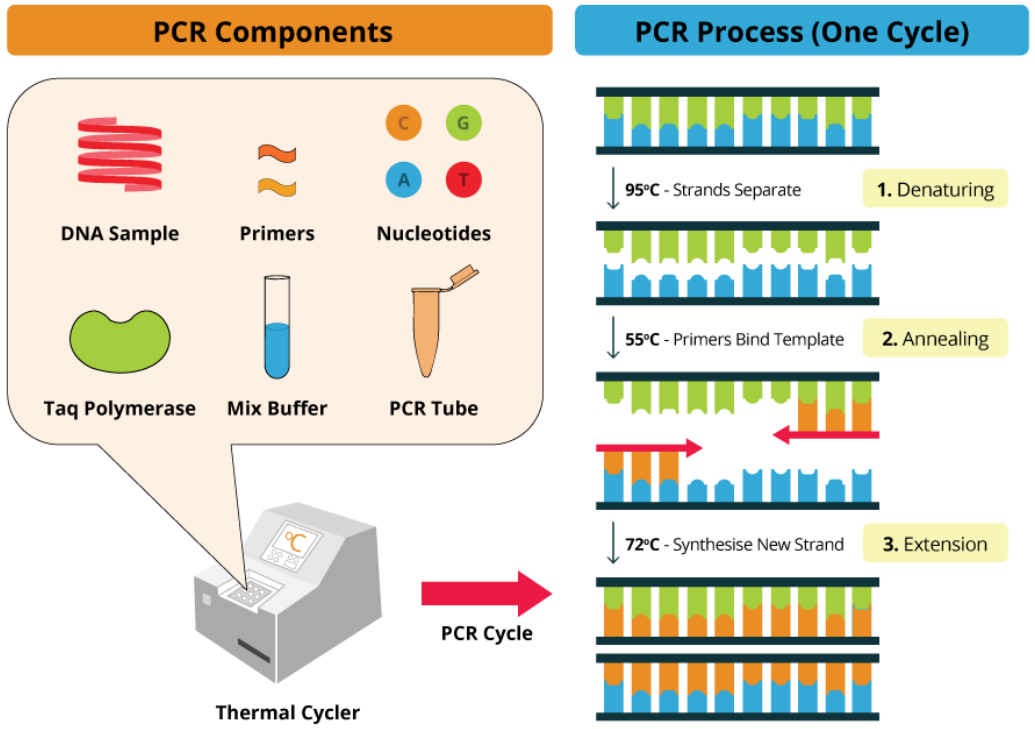
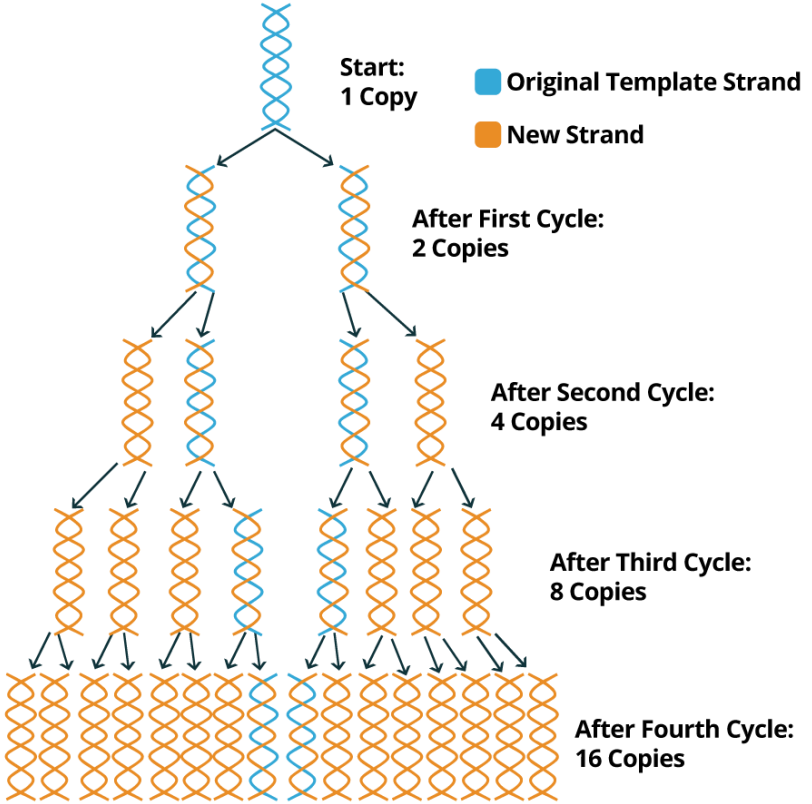
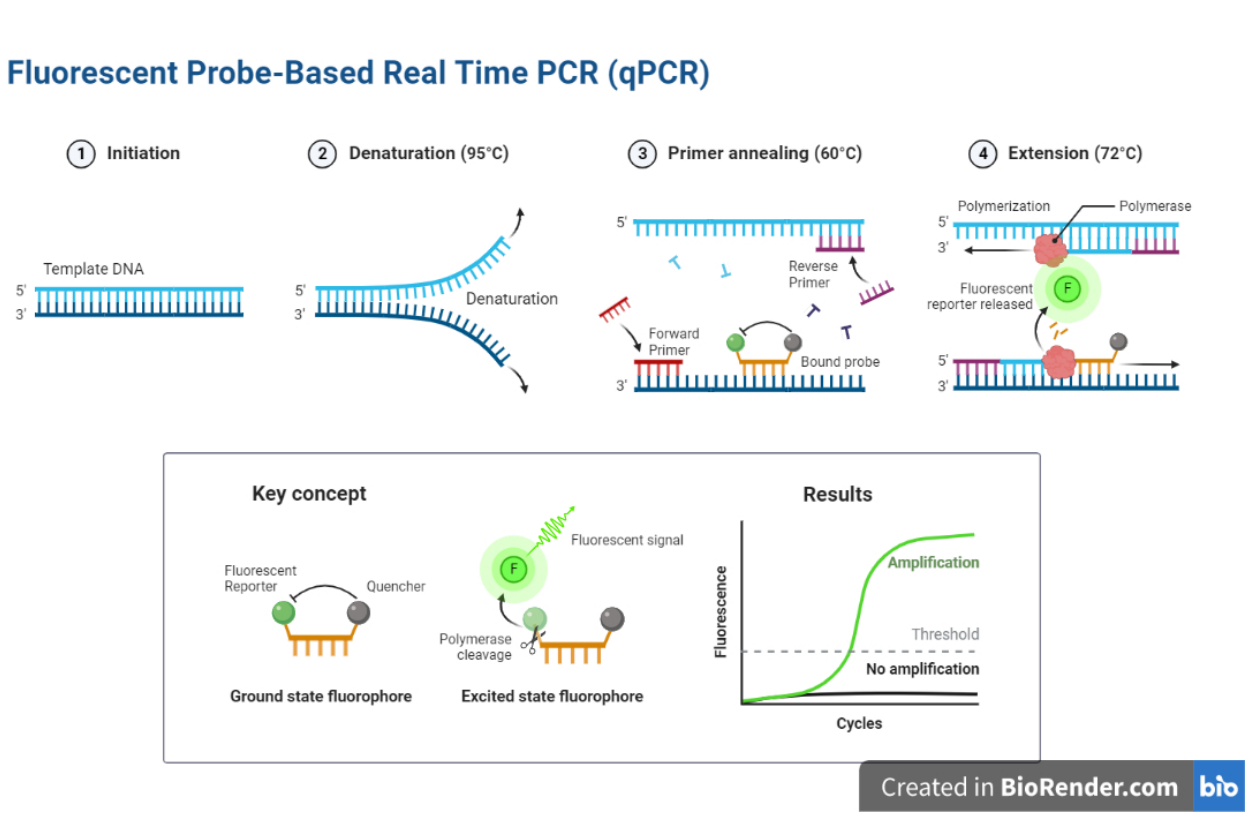
What is PCR?

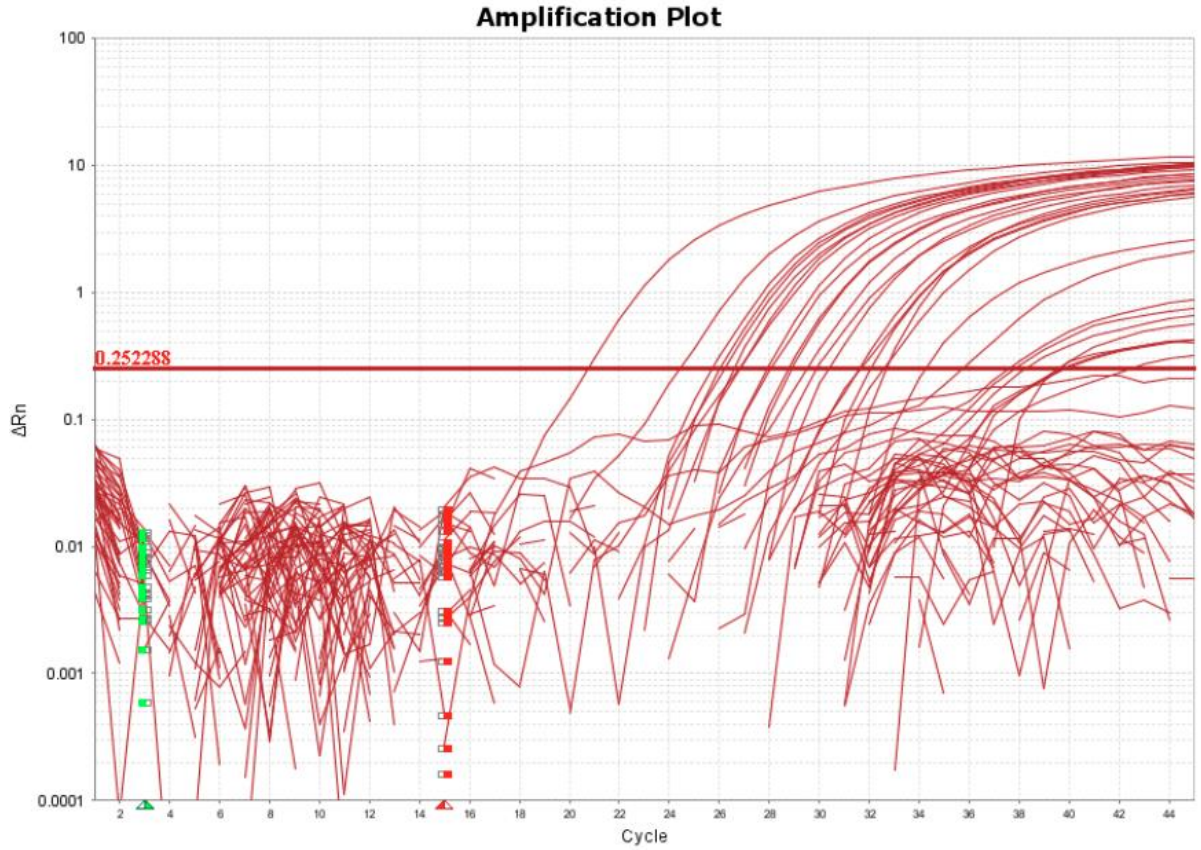




Images sourced from boosterbio.com

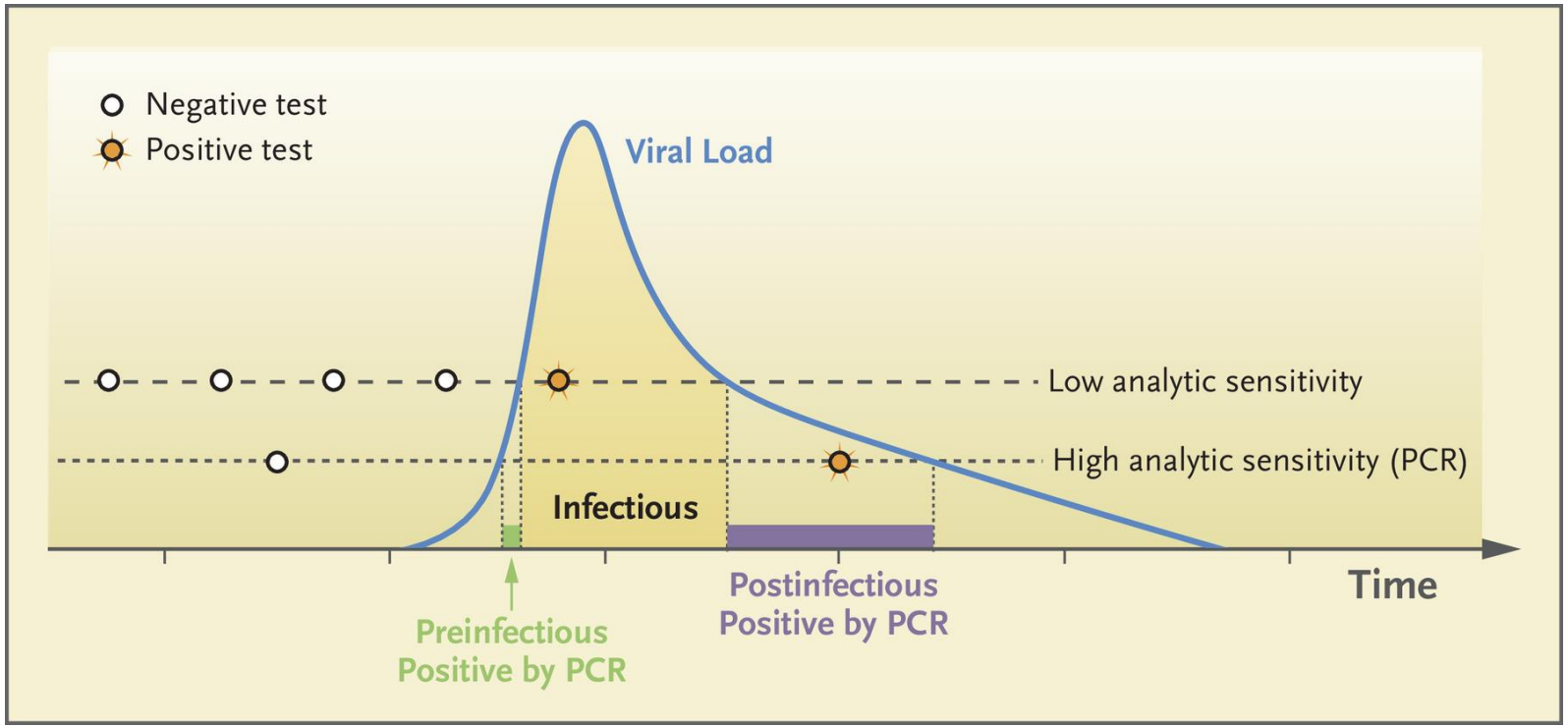
Understanding qPCR





https://doi.org/10.20411%2Fpai.v6i1.435

COVID-19 Shedding



- 24-48 hours pre-symptomatic positive Ct ~30
- Peak viral load/onset Ct ~10
- 5-7 days post onset Ct ~20
- 10-20 days post onset Ct ~30
- 1-3+ months post onset Ct >30, +/- gene dropoff

DOI: 10.1056/NEJMp2025631

Case Scenarios

SCENARIO 1

68 Y/O female presents to hospital for elective surgery. No symptoms preoperatively. On POD 2, develops a fever -> bloodwork and COVID-19 testing ordered.

COVID-19 testing negative for E gene, positive for RdRp and N genes, Ct values 35 and 37 respectively.

Repeat COVID-19 testing 24 hours later shows three genes positive, all with Ct values above 30. Fever resolved.

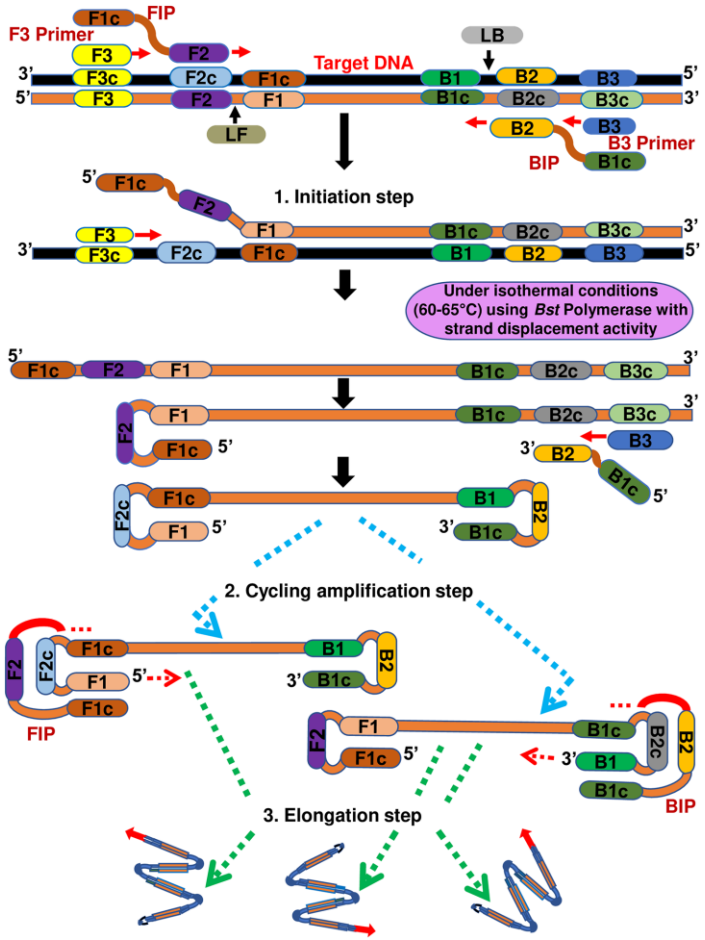
SCENARIO 2

58 Y/O male with history of autoimmune disorder managed with 30mg prednisone daily develops COVID-19 on 11 October. Has mild course of disease and managed on room air; symptoms resolve after ~7 days.

Reswabbed on day 22 post onset of illness, remains asymptomatic; COVID testing positive for S, RdRp, and N genes, Ct values 14, 16 , 16.

Reswab 24 hours later showed Ct values all high 20s.

Loop-mediated Isothermal Amplification (LAMP)



PROS

- Significantly faster reaction versus qPCR
- Lower equipment costs
- Currently unregulated (In Ontario, can be used a POC device without MLT oversight or POC lab license)

CONS

- Currently unregulated
- Loss of dynamic range/sensitivity
- Minor-groove binder for detection -> theoretical loss of specificity

SMGH trial results

- 93% PA (sensitivity); 99% NA (specificity)
- 100% PA for Ct <30; 67% PA for Ct > 30

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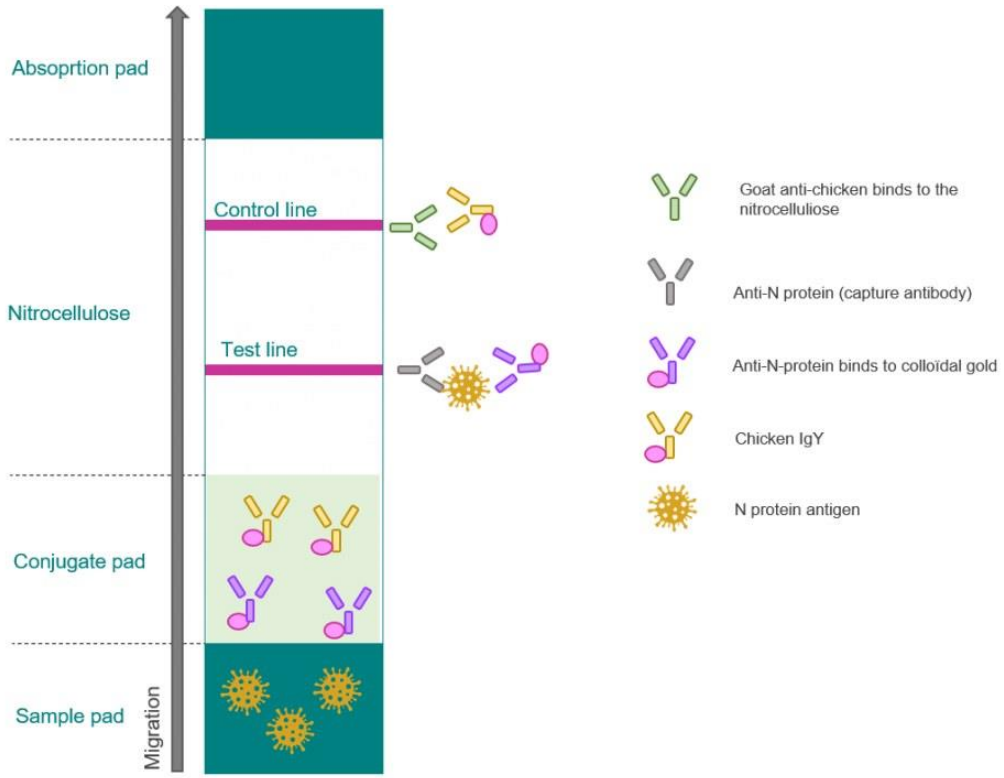
Rapid Antigen Test (Lateral-Flow ELISA)



www.biotrend.com/en/read/newsletter-26/sars-cov-2-covid-19-rapid-antigen-2406.html

PROS

- Fast detection
- Easy for point of use applications
- Dynamic range narrowed to active infection (…in theory)

CONS

- Poorly sensitive, especially in asymptomatic or early infection (Omicron)
- Can yield false positives if not used properly
- Evidence for benefit involves widespread and frequent surveillance -> high cost vs benefit

Thank You

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