

COVID-19 Testing

Dr. David Powell
Medical Advisor, IATA

1

16 June 2020



Types of Tests

- Viral testing
 - Indicates present infection
- Antibody testing
 - Indicates past infection

Viral Testing

Nucleic Acid Amplification Testing (NAAT)

- Gold standard
 - RT-PCR Real-time Reverse Transcriptase Polymerase Chain Reaction
- Targets a combination of several genes in the SARS-CoV-2 genome
- Mainly nasopharyngeal swab
 - but some tests being developed using saliva sample

3

16 June 2020



The RT-PCR Real-time Reverse Transcriptase Polymerase Chain Reaction detects viral RNA in clinical samples, diagnoses active SARS-CoV-2 infection

4 main viral gene targets targeted by PCR assays: N, E, S, RdRP genes [nucleocapsid, the open reading frame, and the envelope and RNA-dependent RNA polymerase genes.]

Technique requires amplifying the gene targets, then detecting. Amplification takes some time

Requirement 1: Reliability

- Sensitivity
 - The proportion of true infections that will be detected by the test as a positive test
- Specificity
 - The proportion of positive tests that represent a true infection
- Verification
 - By a public health agency, therapeutic agency, scientific agency

4

16 June 2020



Testing principles

- **Sensitivity**
 - The proportion of true infections that will be detected by the test as a positive test
 - 95% sensitivity means 5% false negatives (or missed cases)
- **Specificity**
 - The proportion of positive tests that represent a true infection
 - 99% specificity means 1% false positives

In a low risk population (not pre-screened) the risk of false positives is greatly increased – this is the case in a group of well travellers.

High consequences of false positives in travel – last minute cancellation, costs, companion cancellation, loss of confidence.

False negatives highly unacceptable to arriving country and will mean reliance on quarantine

Requirement for reliability needs verification by public health agency, therapeutic

agency, scientific agency

Requirement 2: Speed and Scale

- Able to process hundreds per hour
- Results within an hour
- Technology is developing rapidly

Many tests are fast but not accurate

Some test are fast and accurate, but not at the required scale

Requirement 3: Acceptability

- Discomfort and costs considerations
- Saliva testing is less uncomfortable and requires less training and PPE
- Many tests cost in the order of US\$150 which is not insignificant

When to Test

- On arrival
 - Risks unexpected quarantine for traveler and companions
- On departure
 - Allows a period of incubation beyond
 - Risk last minute cancellation for traveler and companions
- Before departure
 - Allows window of incubation but removes complications at the departure airport
 - May not be accepted by destination country

7

16 June 2020



The incubation period for COVID-19 is generally 2-7 days (up to 12), most often 4-5 days

China-Singapore example

- Both 48 hours prior to travel and again on arrival, each way
- 4 tests per business trip

Antibody testing

- Not reliable for detecting
 - Infection
 - Immunity
- Antigen tests: less reliable

8

16 June 2020



Not reliable for detecting

- Infection due to delayed development of antibodies
- Immunity due to uncertainty about the strength and duration of immunity

Summary

- If required, viral testing is preferred
- The test should be
 - Validated by a reputable agency
 - Reliable
 - Scalable to hundreds of tests per hour
 - Quick results within an hour

9

16 June 2020



Test needs to be validated by reputable National scientific, therapeutic or public health agency

Reliable: Less than 1% false negatives and the lowest possible false positive rate compared with PCR

Capable of scaling to achieve hundreds of tests per hour

Results within an hour