An Introduction to SARS-CoV-2 Lab Testing

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Topics Today: Lab Tests for SARS-CoV-2

- **Lab Tests**
  - PCR, Antigen, and Serology (antibody)
  - Discordant Results
  - Lab Tests in MAVEN Lab Tab
  - Testing Concepts
  - Self-Tests
  - Sequencing for Variant Identification
  - Variant Surveillance and Resources
  - MAVEN Variant Report
  - Your Questions
TESTING for SARS-CoV-2
Lab Testing Resources

Here are some key resources for today’s discussion:

- [MDPH Public Health Advisory Regarding COVID-19 Testing](#)
- [FDA page for Individual EUAs for Molecular Diagnostic Tests for SARS-CoV-2](#)
- [FDA page for Individual EUAs for Antigen Diagnostic Tests for SARS-CoV-2](#)
- [MAVEN Help](#):
  - [Case Classification Manual](#) - How different lab tests look in MAVEN events and associated case classifications.
  - [Testing FAQ (3.0 Update Coming Shortly)](#)
- [CDC Variant Resources](#):
  - [CDC Variant Data Tracker](#): Check out this data page to see numbers of variants reported in Massachusetts and around the country.
  - Check out latest from CDC: [SARS-CoV-2 Variant Classifications and Definitions](#) to learn about different variants, their classifications, and their attributes.
Public Health Advisory Regarding COVID-19 Testing

• Mass.gov Guidance Page for COVID-19 Testing!
  • When should I get tested?
  • What kind of test should I get?
  • What is the difference between PCR tests and rapid tests?
  • Other important public health measures to help prevent the spread of COVID-19, including the Omicron variant,

Types of COVID-19 Tests

- COVID-19 tests are looking for either SARS-CoV-2, the virus that causes COVID-19, or antibodies that your body makes after getting COVID-19 or after getting vaccinated.

- **Viral Tests (2 types):** Tests for SARS-CoV-2 tell you if you have an infection at the time of the test. This type of test is called a “viral” test because it looks for viral infection. Antigen or Nucleic Acid Amplification Tests (NAATs) are viral tests.
  - Specimens are from either the upper or lower respiratory tract.

- **Antibody Tests:** Tests for antibodies may tell you if you have had a past infection with the virus that causes COVID-19. Your body creates antibodies after getting infected with SARS-CoV-2 or after getting vaccinated against COVID-19. These tests are called “antibody” or “serology” tests.
  - Specimens are from blood samples.

- For the purposes of our work at this stage of the pandemic, we care mostly about Viral Tests because we want to know if someone has COVID-19 **NOW.**
Antibody Testing (serology)

• Lots of serology tests are being developed which will look for antibodies. Some are being reported to MDPH and MAVEN. Questions remain:
  • What do the different antibody test results mean?
    • Evidence of old infection?
    • Evidence of immunity?
    • Evidence of acute infection?
  
  • Serology testing should NOT be used to diagnose acute illness.
    • Questions about quality of individual test types remain
    • Unknown timing of COVID antibody development and duration

• No follow-up is expected for serology results in MAVEN at this time. They will come in as SUSPECT cases per the Case Classification Manual.
Viral Tests for SARS-CoV-2

- Lots of different types of specimens can be collected from the upper or lower respiratory tract (oral, nasal, nasopharyngeal swab (NP swab), saliva, etc.).

- The type of swab matters less than the type of test that gets run with the specimen.
  - (Make sure you collect the correct specimen for the specific test. Otherwise, your result may not be valid.)

- For our purposes, Viral COVID-19 tests fall into two main categories:
  1. **Nucleic Acid Amplification Tests (NAATs)**
     - Also called "Molecular" or "PCR" tests
  2. **Antigen**

- **NAAT (PCR) Testing** – swab is utilized to detect virus RNA *Gold Standard.*
  - Typically sent away to a lab and resulted there. May take a day or two for results.
  - A FEW rapid molecular tests, but more common to send away.

- **Antigen Testing** – swab is utilized to detect a protein on the surface of the virus.
  - Always a Rapid Test with results in minutes.
# PCR (NAAT) and Antigen Testing

## PCR Test (NAAT)
- Detects **genetic material** of the virus using a lab technique called polymerase chain reaction (PCR).
- Also Known As:
  - Molecular test
  - Diagnostic test
  - Viral test
  - Nucleic acid amplification test (NAAT)
  - RT-PCR test
  - LAMP test
- MDPH uses "Molecular" & "PCR" interchangeably
- Usually Send to a Lab for Processing
  - Some molecular tests can be rapid, but most are not
- Can be very sensitive.
  - Will remain positive longer than an antigen test.

## Antigen Test – (Rapid)
- Detects certain **proteins** that are part of the virus.
- Also Known As:
  - Rapid Diagnostic Test
  - Point of Care Test
  - Viral Test
  - Over-The-Counter Test
  - Home Test
  - Self Test
- Rapid Results
  - Usually, a rapid test is referring to an antigen test, although ‘could’ be molecular
  - Less sensitive than PCR tests.
  - May need to wait 24-48 hours after a negative and test again if someone is symptomatic
  - A PCR test is not necessary or recommended to confirm a positive result on a rapid antigen test
  - Most Over the Counter Self-Tests are antigens
  - Typically, not valid test for children < 2 yrs.
Q. Is the PCR test cross-reactive with other coronaviruses?

• A. The PCR test is very specific for SARS-CoV-2. The CDC evaluated their assay for cross-reactivity to all 4 seasonal coronaviruses and SARS and MERS. The data is at the end of the Instructions for use on the FDA website. If you want details. 
  https://www.fda.gov/media/134922/download

<table>
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<tr>
<th>Virus</th>
<th>Strain</th>
<th>Source</th>
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<th>2019-nCoV_ N2</th>
<th>Final Result</th>
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<td>Neg.</td>
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</table>

Basically, no, a positive PCR is a positive, and SARS-CoV-2 was detected.
Q. Does someone need to test PCR negative to no longer be considered infectious to others?

A. No. In fact, the PCR test is so sensitive, it has been shown to continue to pick up viral RNA fragments in the respiratory tract of some adults for several weeks. It amplifies traces of the virus – so if you have a small amount of virus, it can still detect it.

Thus, it is not generally recommended for someone to stay in isolation until they test PCR negative. They may test positive for quite some time. (It is preferred to apply a symptom or time-based criteria for discontinuing isolation)

Remember, the PCR test looks for genetic material, and that is not the same thing as live, replication-competent virus.

Antigen tests don’t magnify the amount of virus in the sample you take, so you need a pretty high viral load to test positive.

Are false positives possible due to other pathogens or issues? Yes. But in a global pandemic where everyone has COVID-19, odds are in favor of COVID-19. False positives should be rare.
Q. How is replication-competent virus tested?

A. The only way to know if a person is actually still infectious — shedding or emitting what’s known as “replication-competent virus” — is to try to grow virus from a specimen from that person. That process, called culturing, is time-consuming and in the case of SARS-CoV-2, not so easy to do.

The virus can only be worked on in laboratories that have a high level of biosecurity — BSL 3. Not every hospital would have that capacity. So yes, a test exists. Alas, it is not available in most settings.
Q. If a person tests positive with a rapid antigen test (such as over the counter home tests or rapid tests from schools and testing centers) do they need to get a PCR test to confirm they are positive?

A. No. A PCR test is not necessary or recommended to confirm a positive result on a rapid antigen test. Rapid antigen tests have a low rate of false positives. As a result, a person who tests positive on a rapid antigen test, almost certainly has COVID-19 and must follow isolation guidance.

If a person with COVID-19-like symptoms tests negative on a rapid antigen test, DPH recommends repeating an antigen test in the next 24-48 hours. Alternatively, these individuals could consider getting a PCR test. In the meantime, while waiting to take the additional rapid test or while waiting for the PCR results (which can take 24-72 hours) these individuals should assume they are positive and follow the isolation guidance.
Optimal Timing for Different Tests

- Figure 1: Timelines for optimal use of different diagnostic tests for COVID-19 detection and host response

Figure 1 shows a schematic of the viral dynamics of, and antibody response to, SARS-CoV-2 infection in a patient who is symptomatic, and the optimal timeframe for deployment of different types of tests.

*The Lancet* 2022 399757-768DOI: (10.1016/S0140-6736(21)02346-1)
**TABLE 1: Public Health Follow-up for when Both Antigen & PCR Specimens are Collected**

<table>
<thead>
<tr>
<th>Antigen Positive Result</th>
<th>Surveillance Case Classification</th>
<th>PCR Result Pending</th>
<th>PCR Test Obtained</th>
<th>PCR Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCR Collected within 2 Days Before or After Positive Antigen Test</td>
<td>PROBABLE</td>
<td>Treat as a case. Isolate Case &amp; Quarantine Contacts until PCR Results are In.</td>
<td>PCR Positive</td>
<td>Treat as a case. Isolate Case &amp; Quarantine Contacts.</td>
</tr>
<tr>
<td></td>
<td>CONFIRMED</td>
<td>Likely false positive. Negative PCR trumps antigen result. Isolation can be discontinued for case. Contacts do not need to quarantine.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCR Collected ≥ 3 Days Before or After Positive Antigen Test</td>
<td>PROBABLE</td>
<td>Treat as a case. Isolate Case &amp; Quarantine Contacts. (A negative PCR result collected 3 or more days from an antigen test would not negate the positive Antigen result)</td>
<td>CONFIRMED</td>
<td>Treat as a case. Isolate Case &amp; Quarantine Contacts. (A negative PCR result collected 3 or more days from an antigen test would not negate the positive Antigen result)</td>
</tr>
</tbody>
</table>

**Health agent should contact mavenhelp@mass.gov or the Division of Epidemiology at 617-983-6800 with MAVEN ID# for cases requiring changes in surveillance case classification status. Be sure to update notes in your MAVEN cases accordingly.**
Antigen+ & PCR-

- Any negative PCR collected within 2 days before or after will trump the Antigen result.

<table>
<thead>
<tr>
<th></th>
<th>- Day 4</th>
<th>- Day 3</th>
<th>- Day 2</th>
<th>- Day 1</th>
<th>Day 0</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Antigen +</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td>PCR -</td>
<td>PCR -</td>
<td>PCR -</td>
<td>PCR -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This case is presumed negative. Revoke Case.**

** Health agent should contact mavenhelp@mass.gov or the Division of Epidemiology at 617-983-6800 with MAVEN ID# for cases requiring changes in surveillance case classification status. Be sure to update notes in your MAVEN cases accordingly.
Antigen+ & PCR-

- Any negative PCR collected $\geq 3$ days before or after Positive Antigen does not change follow-up.

<table>
<thead>
<tr>
<th>- Day 4</th>
<th>- Day 3</th>
<th>- Day 2</th>
<th>- Day 1</th>
<th>Day 0</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
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</thead>
<tbody>
<tr>
<td>PCR-</td>
<td>PCR-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Antigen +

PCR-

PCR-

Negative PCRs collected so far from the antigen test do not give us enough information to trump the +Antigen. Treat as a case and follow up.
Discordant or Puzzling Test Results

• These rules will not be perfect. And sometimes a case may end up with a case classification that differs from a clinical recommendation or control measure recommendation.
  • Are the test results saying one thing but the case’s symptoms and exposure history telling you something different?
  • Consider retesting in 24-48 hours.

• There are certain scenarios and higher risk settings where a more cautious approach is appropriate (such as treating an antigen positive case like a case in a LTCF).
  • LTCFs, other congregate care settings, etc. – feel free to call the Epi Program with questions. (Staff are often being tested via antigen due to symptoms/exposure.)
# Molecular (PCR), Antigen, and Antibody (Serology) Testing

## Molecular/NAAT Test (PCR)
Listed in Lab Tab as follows:
- 2019-nCoV Real-time RT-PCR (PCR)
- SARS coronavirus 2 RdRp gene (PCR RAPID)

Panel Tests that Include COVID-19:
- 2019-NCOV RNA PNL XXX NAA+PROBE
- Flu A/Flu B/SARS COVID-2/SARS-related coronavirus RNA panel
- Resp virus Pnl XXX PCR

## Antigen Test - (always rapid)
Listed in Lab Tab as follows:
- SARS-CoV-2 Ag (Antigen Test)

## Antibody (Serology Test)
Listed in Lab Tab as follows:
- SARS-CoV-2 IgM (Serology IgM specific)
- SARS-CoV-2 IgG (Serology IgG specific)
- SARS-CoV-2 IgA (Serology IgA specific)
- SARS-CoV-2 IgG + IgM (Serology Antibody Type Unspecified)
- SARS-CoV-2 TCRB Bld Ql Seq (T-cell receptor beta (TCRB) gene)
- SARS coronavirus 2 spike protein RBD Ab.neut : PrThr : Pt : Ser/Plas:Ord:IA

Positive Molecular Test: Case Classification = **CONFIRMED**

Positive Antigen Test: Case Classification = **PROBABLE**

Positive Antibody Test: Case Classification = **SUSPECT**

Summary Time: Test Results & Your Questions

Help! I have a million questions about different lab results & what to do!

- COVID-19 Materials/Training Folder
  - Subfolder: Case Follow-Up Tools
    - Lab FAQ Document: 2022 Update Coming Soon
      - Describes different test results and what to do
      - Outlines discordant results and what they mean

Case Classification Manual Folder
- The Case Classification Manual gives us nationally recognized definitions for classifying cases and ensures confirmed cases in Massachusetts are comparable to confirmed cases in Mississippi.
- Case Classification Manual Folder will have the updated Case Definitions and also a list of different labs and how they will look in MAVEN.

- This is an Excellent Resource.
Testing Concepts

• No test is perfect. But they are the best indicators we have at the moment. Thus, we can apply some generalities to their results – understanding that we will not be correct 100% of the time.

• **Generalities:**
  • The PCR will be positive for a while. So probably not the best test for trying to test out of isolation earlier or determining if you are no longer infectious.
  
  • The antigen test is more likely to be positive when you have more virus, so the thought would be that this is the better test for testing out of isolation earlier or a preliminary indicator if your viral load has gone down. This test would become negative first.
  
  • **Are you not infectious towards others if your antigen is negative?** Not always, but you are probably less infectious, so this is a helpful sign.
Isolating Cases & Repeat Testing

• Remember, in most situations for the general public, there is not a recommendation to test again in the days following diagnosis or to end isolation. Instead, if you meet the symptom-based criteria by Day 5, you can exit home isolation (while masked) for Days 6-10.

• Q. What should a case do if they DO test on Day 5 and remain antigen positive? Can they exit home isolation on Day 6?

  • A. If a case tests positive via antigen test on Day 5 or later, we would NOT recommend that they exit isolation at that time.
    • We would recommend retesting in a few days (Day 7-8) and they can exit isolation at that time if negative.
    • In all cases, masking is required through Day 10. Many cases are likely still positive and presumably infectious at Day 5.
Can You Get COVID-19 Again?

- Reinfection is possible, and variant considerations have complicated the answer to this question, but here are some key points:

  - **Covid-recovered individuals** have presumed immunity for a short period of time. Additional positive tests that are reported to MAVEN within the next 90 days of their event time period will append to the first COVID-19 MAVEN event, and are assumed to be part of that initial infection.

  - **Additional PCR Results:** We know people continue to test PCR positive for a while, despite no longer being infectious towards others. There is no recommendation to retest and a COVID-recovered individual would **not need to re-isolate in the 90 days after their initial test (or symptom onset)** if they had an additional PCR positive at that time.

  - **Additional Antigen Results:** Antigen tests should NOT remain persistently positive from the initial infection. Additional antigen positive tests later in the 90 days following recovery will not automatically be flagged as new MAVEN events but should be treated with caution if identified. (See next slide)

  - If you have a positive lab test > 90 days after your initial diagnosis, this **SHOULD be considered a “new” infection, and a new MAVEN event will appear for officially reported lab results.**
Interpreting Additional Antigen+ Results in the 90 Days Following a COVID-19 Diagnosis

- Conventional wisdom suggests that cases should not remain persistently Antigen+ following a diagnosis. (this could change as data accumulate)
- Testing is not recommended within 90 days following a COVID diagnosis
- IF retesting occurs despite that:
  - Positive within 0-14 days post diagnosis, represents the current COVID infection
  - Positive >14 days post diagnosis + symptoms
    - Either isolation or medical evaluation
    - If medically evaluated and COVID ruled out, no isolation
  - Positive >14 days post diagnosis w/out symptoms
    - Evaluate patient risk
      - If done because of exposure, then considered true positive.
      - If done for no reason, absence of exposure, consider false positive, especially if other immediate prior/subsequent tests negative, and particularly when community prevalence is low.
The self-test you perform at home is generally the same antigen test technology you might get at the doctor’s office.
At Home Testing: Brands & Process Vary

• **Mail Away PCR tests have been available for a while now.**
  • Patient can order a test, collects swab at home, and sends the specimen to a certified lab for processing and reporting. While fidelity isn’t perfect, these are reported as regular PCRs from the formal lab and should be treated as such.

• **“Newer” to the market are At Home Rapid Antigen Tests where patient receives result at home. These vary in technology and reporting process:**
  • **Self-Tests Over the Counter:** Over the counter purchase – patient buys and performs testing, result is unofficial and not reported. Public health does not do follow-up on these unofficial self-tests.
  • **At-Home Testing with Prescription & Teleproctoring:** Patient is prescribed the test, obtains the kit, sample collection and test performance is done under observation of the healthcare professional, and results are reported via the app. These are official test results and would likely populate MAVEN.
  • **Apps/Prescriptions/Etc.:** There are many versions of home testing. Some use apps, some use teleproctoring, some use both. Distinctions are imperfect, but we typically make the distinction between CLIA-certified provider tests (generally those are proctored tests that are officially reported) and those that are not proctored or reported.

• This is a rapidly evolving market and home testing is likely a significant trend for the future.
BinaxNOW SELF test vs. HOME test

SELF TEST:
- No online guide (this is unobserved)
- No App for reporting is listed
- No Prescription: you can buy these anywhere over the counter.

HOME TEST:
- Certified video guide to supervise testing.
- App and reporting.
- Prescription home use.
Self-Test Reminders (Over the Counter Tests)

- **Self-Tests** are great in many ways and have lots of utility, and more are likely coming on the market in the future. But they are the responsibility of the person taking them. They are NOT the responsibility of public health.

- **People with Self-Tests should notify their OWN contacts.**
  - People can utilize [MassNotify](#) to do some of this!

- **LBOHs should not enter self tests into MAVEN.** MAVEN is for OFFICIAL disease reporting.
  - Antigen tests performed by a medical provider are typically reported to MDPH and will show up in MAVEN.
  - Antigen tests performed by a person themselves at home typically do not have a reporting mechanism for MAVEN.

- **Self-Tests are NOT OFFICIAL TEST RESULTS for many scenarios**, and people should consider that when determining which test type to perform. For most of our sector guidance, they are acceptable, but there may be additional situations that require proctored or official test results. (Travel, etc.)

- **If someone has a positive self-test, they should act like they are positive and isolate.** You can answer their questions around isolation and quarantine timing.
  - Stress it is based upon the information they are telling you.
  - Confirmatory testing (PCR) is usually not needed.

- **Self-Tests are one more way we are trying to empower our citizens and lean a bit more on personal responsibility models for COVID-19 prevention.**
Self-Tests
(Over the Counter (OTC) Home Tests)

- Q. Should LBOHs recommend PCR tests to follow up on a positive self-test?
  - A. No. People who test positive on an at-home test should isolate according to current DPH protocols and should notify their close contacts.
    - These individuals do not need a PCR.
  - People who test negative on an at-home antigen test AND have COVID symptoms should consider re-testing with an antigen test in 24-48 hours or get a PCR test.

- Self-Tests (Over-the-Counter (OTC) Tests) FAQs and General Guidance for the Public
Q. Are home tests accepted as proof of a positive or negative test for international travel, and if so, how would that work?

A. It is the responsibility of the traveler to determine what is required for their destination (every destination has different requirements). And they should plan accordingly to ensure they have documentation from an official test result and/or documentation from their provider.

- Generally, at-home tests need to be officially proctored (via tele-health) to meet most travel requirements, however this needs to be determined by the traveler and is not the responsibility of MDPH or Local Health.

Variants of Concern (VOCs)
Genetic Variants of SARS-CoV-2

- Viruses like SARS-CoV-2 continuously evolve as changes in the genetic code (genetic mutations) occur during replication of the genome.

**Key Definitions**

- **Mutation**: A mutation refers to a single change in a virus’s genome (genetic code). Mutations happen frequently, but only sometimes change the characteristics of the virus.

- **Lineage**: A lineage is a group of closely related viruses with a common ancestor. SARS-CoV-2 has many lineages; all cause COVID-19.

- **Variant**: A variant is a viral genome (genetic code) that may contain one or more mutations. In some cases, a group of variants with similar genetic changes, such as a lineage or group of lineages, may be designated by public health organizations as a [Variant of Concern (VOC)] or a [Variant of Interest (VOI)] due to shared attributes and characteristics that may require public health action.
Genetic Variants of SARS-CoV-2

- As expected, genetic variants of SARS-CoV-2 have been emerging and circulating in the United States and globally throughout the COVID-19 pandemic. To inform local outbreak investigations and understand national trends, scientists compare genetic differences between viruses to identify variants and how they are related to each other.

- Viral mutations and variants in the United States are routinely monitored through sequence-based surveillance, laboratory studies, and epidemiological investigations.

Why Do We Want to Track Variants?

- **Mutations can:**
  - Change disease characteristics
  - Make virus less detectable by current tests
  - Increase reinfection frequency
  - Reduce efficacy of vaccination
  - Reduce efficacy of therapeutics
Genetic Variants of SARS-CoV-2

• A US government interagency group developed a Variant Classification scheme that defines three classes of SARS-CoV-2 variants:
  • Variant Being Monitored (VBM)
  • Variant of Interest (VOI)
  • Variant of Concern (VOC)
    • Delta (B.1.617.2 and AY lineages)
    • Omicron (B.1.1.529 and BA lineages)
  • Variant of High Consequence (VOHC)

• Some variants seem to spread more easily and quickly than other variants, which may lead to more cases of COVID-19. An increase in the number of cases will put more strain on healthcare resources, lead to more hospitalizations, and potentially more deaths.

• These classifications are based on how easily the variant spreads, how severe the symptoms are, how the variant responds to treatments, or how well vaccines protect against the variant.

• For a full list of different variants in each of these categories and the state of the science regarding their individual attributes (increased transmission, hospitalization, disease severity, decreased susceptibility to treatments like monoclonal antibody treatment, etc.), see the latest from CDC: SARS-CoV-2 Variant Classifications and Definitions
Genetic Variants of SARS-CoV-2

- **Q.** How do we know if someone has a variant?

- **A.** The PCR test does not identify variants.
  
  - In order to identify a variant, the positive PCR specimen must be further tested through Whole Genome Sequencing (WGS).
    - More labs are performing this sequencing, but not every specimen will be sequenced.
    - Rapid tests do not allow for sequencing (the specimens are not preserved and sent to a sequencing lab). So, sequencing will only occur if a positive routine PCR result is then processed by a WGS lab.
  
  - At this time, WGS results are for surveillance purposes, and results are not CLIA-approved and reportable in the same way other test results are. Thus, providers and patients do not receive these results back directly.
Genetic Variants of SARS-CoV-2

• For **new** variants, we are looking for associations with travel vs. community transmission.
  
  • It is very important to note if a case had travel in the 2 weeks prior to their illness so that we can identify if/when a variant switches to community (local) transmission.
    
    • MDPH may come back and ask you to follow up with a case if a new or rare variant is sequenced to make sure you confirmed any travel or other risk associated with their infection.

• Once a new variant is “here,” we do not have additional data points or extra interview processes for variant cases.

• **At this time, there are NO additional isolation/quarantine recommendations for cases and their contacts. Please follow current isolation/quarantine practices.**
Q. Please discuss PCR and antigen test accuracy. Do both tests pick up Omicron?

- The FDA evaluates EUA tests against variants including Omicron
- The FDA has not identified any antigen tests that are expected to fail to detect the Omicron variant (the surface proteins remain relatively consistent across variants)
- FDA has provided information that antigen tests may be less sensitive at detecting Omicron
  - This may be in part due to lower levels of virus in the nose being seen with Omicron
  - It has been reported that the Omicron variant produces a higher level of virus in the throat
  - People should not take throat swabs and use them in antigen tests as the tests are not validated for that type of sample

Variants of Concern Report

- Remember to run this for shorter periods of time (less than 30 days).
  - If you are looking for Omicron, stick to December 2021 & after.
  - This report has to process a lot of backend information – give it time.

- Remember there are no additional quarantine or isolation guidelines associated with different variants so this should not influence your interviews or discussions with cases & contacts.

- Report Tip Sheet on how to run several reports is in MAVEN Help [here](#).
Variants – They are often listed by numbers.

- You would see these numbers in the Lab Tab or variant Report for reported sequences.

- The SIG Variant classification scheme defines four classes of SARS-CoV-2 variants:
  - **Variant Being Monitored (VBM)**
    - Alpha (B.1.1.7 and Q lineages)
    - Beta (B.1.351 and descendent lineages)
    - Gamma (P.1 and descendent lineages)
    - Epsilon (B.1.427 and B.1.429)
    - Eta (B.1.525)
    - Iota (B.1.526)
    - Kappa (B.1.617.1 and B.1.617.3)
    - Mu (B.1.621, B.1.621.1)
    - Zeta (P.2)
  - **Variant of Interest (VOI)**
  - **Variant of Concern (VOC)**
    - Delta (B.1.617.2 and AY lineages)
    - Omicron (B.1.1.529 and BA lineages)
  - **Variant of High Consequence (VOHC)**
- To date, no variants of high consequence have been identified in the United States.
## Variant Report – Where to See Variant Sequencing

You may need to look in two different columns to see the sequencing lineage.

**Delta (B.1.617.2 and AY lineages)**

- Caselid: MAVEN#
- SEQUENCED_VOC: YES
- Specimen date: MM/DD/YYYY
- Lab facility: Lab Name & Address
- Result: AY.14
- Sequence repository identifier: xxxxx/xxxx/xxx-xxxxxx
- Reason for Sequencing: MDPH-R543

**Omicron (B.1.1.529 and BA lineages)**

- Caselid: MAVEN#
- SEQUENCED_VOC: YES
- Specimen date: MM/DD/YYYY
- Lab facility: Lab Name & Address
- Result: AY.14
- Sequence repository identifier: xxxxx/xxxx/xxx-xxxxxx
- Reason for Sequencing: MDPH-R543
Summary Time: Genetic Variants of SARS-CoV-2

- **To identify a variant**, a PCR specimen must be sent to a Whole Genome Sequencing (WGS) lab for sequencing.
  - This cannot be done with rapid test samples.
  - WGS of specimens to look for variants is primarily a surveillance function and most patients do not receive their results. Volume of sequenced specimens is growing nationally, but not all specimens are sequenced at this time.

- **Follow-up Guidance:**
  - There are no additional follow-up requirements for investigations at this time (although early on we want to make sure risk and travel are documented through the standard interview process to identify if a new variant is travel associated or the result of community transmission.)
  - **There are NO additional isolation/quarantine recommendations for cases and their contacts. Please follow current isolation/quarantine practices.**

- **Data:**
  - [CDC Variant Data Tracker](https://www.cdc.gov/coronavirus/2019-ncov/your-health/variants.html): Check out this data page to see numbers of variants reported in Massachusetts and around the country.
  - Check out latest from CDC: [SARS-CoV-2 Variant Classifications and Definitions](https://www.cdc.gov/coronavirus/2019-ncov/your-health/variants.html) to learn about different variants, their classifications, and their attributes.
Your Questions

All this covid-19 talk is annoying. Here are some better lab results.