COVID-19 Vaccines and Variants: What We Know So Far

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We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally-recognized tribes, with Tucson being home to the O’odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service.
Webinar Notes

- Please submit your questions in the Q&A tab at the bottom of your screen.
- The Chat function allows you to send chat messages to your colleagues in the meeting.
- The webinar Recording, the Q&A feed, the Chat feed, and any presentation materials will be available after the webinar at https://provost.arizona.edu/content/campus-webinars.
The Central Dogma: DNA->RNA->protein
Life Cycle of SARS-CoV-2, the virus that causes COVID-19
The Moderna and Pfizer/BioNTech vaccines contain just 1 type of RNA.
The immune system recognizes spike protein and responds.
Antibodies are more concentrated in the lungs than in the nose and throat.
SARS-CoV-2 enters through the nose and throat
Severe disease can be caused by unchecked viral replication in the lungs.
Vaccine-induced antibodies in the nose and throat can prevent infections if the infectious dose is low.
Antibodies and T cells can coordinate to prevent symptomatic infections if the virus is slow.
How are safety and efficacy assessed in a Phase 3 trial?
Efficacy of the Moderna vaccine

B Modified Intention-to-Treat Analysis

<table>
<thead>
<tr>
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<th>Vaccine Efficacy (95% CI)</th>
<th>Incidence Rate (95% CI) per 1000 person-yr</th>
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<tbody>
<tr>
<td>Placebo</td>
<td>93.0 (88.9–95.6)</td>
<td>79.7 (70.5–89.9)</td>
</tr>
<tr>
<td>mRNA-1273</td>
<td></td>
<td>5.6 (3.4–8.8)</td>
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![Graph showing cumulative event rate over days since randomization for Placebo and mRNA-1273 groups.](image-url)
Delta: What has changed?

A HIDDEN SPIKE
The spike protein of SARS-CoV-2 is coated in sugar molecules, or glycans, which disguise it from the immune system. It can hinge at three points on the stalk, giving it flexibility.

- **L452R**: Evades some antibodies
- **Δ157-158**: Increases transmissibility, *a lot*
- **P681R**

**Share of SARS-CoV-2 sequences that are the delta variant**
Shown is the delta variant’s share of total analyzed sequences in the last two weeks. This share may not reflect the complete breakdown of cases since only a fraction of all cases are sequenced.

Source: CoVariants.org and GISAID – Last updated 17 August 2021, 21:00 (London time)
The Delta variant reaches much higher viral loads than previous variants.
Reduced effectiveness of vaccines against Delta, but by how much???
What does reduced vaccine effectiveness really mean?

**80% effective**

Delta

**86% effective**

unvaccinated

vaccinated
Tipping the scales back in the favor of vaccines

- Outdoor activities
- Indoor ventilation
- High-quality masks
Does vaccination reduce the chance that you will pass the virus on to someone else?

How different estimates of vaccine efficacy against the Delta variant compare

Two-dose vaccine efficacy against infection and hospitalisation, by vaccine manufacturer, country and period of study

Source: FT research © FT

Chia et al., MedRxiv, 2021
Is immunity waning? Do we need booster shots?

Expected beginning of booster effect

Credit: Dvir Aran, Israel MoH
Vaccine inequity: a barrier to ending the global pandemic

Daily new confirmed COVID-19 cases per million people
Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.

Share of people vaccinated against COVID-19, Aug 13, 2021
Share of people fully vaccinated against COVID-19  Share of people only partly vaccinated against COVID-19

United States
50%  8.9%  59%

Iran
3.8%  12%  16%

Georgia
5.8%  7.8%  14%

Botswana
6.2%  4.2%  10%

Eswatini
7.3%  8.3%

Source: Official data collated by Our World in Data. This data is only available for countries which report the breakdown of doses administered by first and second doses in absolute numbers.

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Who should get mRNA boosters?

- Immunocompromised? **YES**, definitely, *right now*
- J&J recipients? Yes, but hoping for guidance from CDC/FDA soon
- Over age of 60-70? Probably.
- All others????
Why get an antibody test?

Help us learn more about the virus and immunity

- How long does immunity last?
- How many antibodies does it take to achieve protection against infection?
- How does age affect immune responses to infection or vaccination?
- How do symptoms after infection or vaccination correlate with antibody levels?
Voluntary antibody testing is through a University of Arizona IRB-approved research study.