DHS SCIENCE AND TECHNOLOGY

Supplemental Reference for SARS-CoV-2 Delta Variant

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Homeland Security

Science and Technology

Department of Homeland Security Science and Technology Directorate – SARS-CoV-2 Delta (B.1.617.2) Variant Update – 8/13/2021

Overview – What is the Delta variant and why are scientists concerned?

- The Delta variant of the SARS-CoV-2 virus emerged in India in September, 2020,[1] spread to 105 countries, and now accounts for more than 90% of new COVID-19 cases in the U.S.[2]
- The Delta variant is much more transmissible,[3-4] may produce more severe illness,[5] and is more likely to cause reinfection than previous variants,[6] particularly for the unvaccinated.[7]
- Full vaccination,[8] mask use,[9] and decontamination[10] remain the major tools to combat COVID-19.[11]

Genomics – How does the Delta variant compare to previous SARS-CoV-2 strains and variants?

- The Delta variant is a SARS-CoV-2 mutant strain with a unique set of genetic changes including important mutations in the spike protein. One of these, L452R, has been linked to partial resistance to neutralizing antibodies and higher transmissibility.[12]
- The Delta variant (and subvariants AY.1, AY.2, and AY.3) currently account for 95% of sequenced new cases in the U.S.[2]

Transmissibility – How does it spread from one host to another? How easily is it spread?

- The Delta variant is highly transmissible.[13] Its basic reproduction number (R0), defining the average number of new infections from a single infectious individual, is estimated between 5 and 9,[3-4] compared to 2.2-3.1 for wild-type SARS-CoV-2.[14-18]
- Household secondary attack rates of the Delta variant may be as high as 53%,[13] and may be higher in individuals younger than 10.[19] Early evidence suggests that the Delta variant spreads rapidly in schools.[20]
- The Delta variant produces higher virus levels for infected persons compared to the original SARS-CoV-2 and other variants.[21] Also, the Delta variant virus levels in vaccinated breakthrough infections are similar to unvaccinated infections, which means that the vaccinated may spread infections as well as unvaccinated persons.[22-23]

Vaccines – Are there effective vaccines? How common are breakthrough infections?

- Current vaccines in the U.S. are protective against the Delta variant when individuals are fully vaccinated. The Pfizer/BioNTech vaccine provides 93-96% efficacy against hospitalization[24-25] and 64-88% efficacy against symptomatic infection.[24-26] Preliminary in vitro results show neutralization of the Delta variant by both the Moderna[27-28] and J&J/Janssen (1-dose type) vaccines.[29] Preliminary work suggests that vaccine efficacy in the U.S. was lower in July, though additional research is needed.[30]
- Partial vaccination, however, is ineffective. Receiving only 1 dose of a 2-dose vaccine (Pfizer/BioNTech or Moderna) is only 10-30% effective against the Delta variant.[26, 28, 25, 31] Pfizer/BioNTech is researching Delta-specific booster vaccine doses.[32]
- Breakthrough cases (i.e., infections after vaccination) involving the Delta variant are more common than with wild-type virus or other variants (but are still rare overall), and vaccination drastically reduces the risk of severe disease or hospitalization.[33-34]
- The Delta variant results in greater reinfection risk than wild-type SARS-CoV-2 or other SARS-CoV-2 variants (e.g., Alpha).[6] Vaccination provides greater protection against infection with the Delta variant than prior infection with wild-type SARS-CoV-2 or other variants.[7]

Protective Immunity – How long does the immune response provide protection from reinfection?

- Vaccination provides greater protection from the Delta variant than prior infection with SARS-CoV-2.[7] Convalescent plasma from those infected with Gamma or Beta variants showed reduced neutralization of the Delta variant, suggesting elevated potential for reinfection.[35]
- Reinfection with the Delta variant was 46% more likely than with the Alpha variant, with the highest risk seen more than six months after initial infection.[6] However, reinfections in this study were rare overall (1.2%).[6]

Medical Treatments – Are there effective treatments?

- The Delta variant is resistant to the monoclonal antibody bamlanivimab.[36]
- Proposed medical treatments for the SARS-CoV-2 Delta variant are the same as for other lineages and variants.[37-40] The COVID-19 MQL has additional details on recommended treatment guidelines.[41]

Incubation Period and Acute Clinical Presentation – How long until symptom onset? What are initial symptoms?

- There is some evidence that the Delta variant spreads faster than prior virus lineages (i.e., time between successive cases of 2.9 vs 5.7 days, respectively),[42] though additional studies are needed.[43]
- Individuals infected with the Delta variant are hospitalized almost twice as often as those with the B.1.1.7 (Alpha) variant.[5]
- The Delta variant may cause higher rates of headache and runny nose and lower rates of taste/smell disfunction compared to wild-type SARS-CoV-2 and other variants.[44-45]
- There is anecdotal evidence of more severe disease in younger, healthy individuals due to the Delta variant, though it is unclear if the variant itself causes more severe illness or if other factors (e.g., lower vaccine prevalence) are responsible.[46]

What else do we know?

Other aspects of the Delta variant are either presumed or confirmed to agree with those of previously identified SARS-CoV-2 strains. Additional information can be found in the **DHS S&T Master Question List (MQL) for COVID-19**.

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