Homeland Defense & Security Information Analysis Center

HDIAC TECHNICAL INQUIRY (TI) RESPONSE REPORT

SARS-CoV-2 Delta Variant

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The Homeland Defense & Security Information Analysis Center (HDIAC) received a technical inquiry requesting information on the SARS-CoV-2 Delta variant, also known as the B.1.617.2 lineage, a variant of lineage B.1.617 of SARS-CoV-2 as of July 2021. HDIAC searched open sources for relevant information on the efficacy, transmissivity, and any unique hazards associated with the Delta variant. The results were compiled into a report comparing the transmissibility and efficacy of vaccines between the B.1.617 lineage (Alpha variant) and B.1.617.2 lineage (Beta variant) and sent to the inquirer.

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A chief service of the DoD IACs is free technical inquiry (TI) research, limited to 4 research hours per inquiry. This TI response report summarizes the research findings of one such inquiry jointly conducted by HDIAC.

ABSTRACT

The Homeland Defense & Security Information Analysis Center (HDIAC) received a technical inquiry requesting information on the SARS-CoV-2 Delta variant, also known as the B.1.617.2 lineage, a variant of lineage B.1.617 of SARS-CoV-2 as of July 2021. HDIAC searched open sources for relevant information on the efficacy, transmissivity, and any unique hazards associated with the Delta variant. The results were compiled into a report comparing the transmissibility and efficacy of vaccines between the B.1.617 lineage (Alpha variant) and B.1.617.2 lineage (Beta variant) and sent to the inquirer.

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1.0 TI Request

1.1 INQUIRY

Can you provide current and relevant information on the SARS-CoV-2 Delta variant, also known as lineage B.1.617.2, a variant of lineage B.1.617 of SARS-CoV-2 as of July 2021?

1.2 DESCRIPTION

The inquirer was interested in available information on vaccine efficacy, transmissivity, and unique hazards (if any) with associated risks. The inquirer was also interested in any data related to air transportation or the airport environment.

2.0 TI Response

2.1 INTRODUCTION

The number of COVID-19 cases has been dropping across the country due to the U.S. Department of Defense's efforts toward vaccinating. However, new variants of the SARS-CoV-2 virus are threatening our ability to return to normal. The Delta variant, or B.1.617.2, is showing high transmissibility. The Homeland Defense & Security Information Analysis Center searched open sources for relevant information on the efficacy, transmissivity, and any unique hazards associated with the Delta variant. The results were compiled into a report comparing the transmissibility and efficacy of vaccines between the B 1.617 lineage (Alpha variant) and the B 1.617.2 lineage (Beta variant) and sent to the inquirer.

2.2 SARS-COV-2 DELTA VARIANT

Genetic variants of the SARS-CoV-2 virus, also known as the COVID-19, have begun developing and circulating across the world [1]. This is expected because all viruses mutate over time. As a virus replicates, it undergoes genetic mutations that can change the surface of the virus' proteins and antigens [2]. However, not all mutations are created equally. Some mutations can make the virus more unstable and vulnerable, while other mutations can make the virus more deadly or contagious. According to UnityPoint Health, "When a virus replicates, and the end copy has differences (in DNA or RNA), those differences are mutations. When you accumulate enough mutations, you get a variant" [3].

Each variant is classified into one of three different classes: Variant of Interest (VOI), Variant of Concern (VOC), or Variant of High Consequence (VOHC). According to the Centers for Disease

Control and Prevention, "Each classification of variant includes the possible attributes of lower classes (i.e., VOC includes the possible attributes of VOI)" [1].

There are currently four SARS-CoV-2 VOCs; one of those is the Delta variant [1]. The Delta variant has several different lineages, with each containing different sets of mutations. One of these lineages is the B.1.617.2 strain [4].

In December 2020, the B.1.617.2 lineage was first detected in India by researchers [5]. Other research suggests that the Delta variant is the most transmissible variant yet, surpassing the previous variants by 43%–60% [6] and spreading 225% faster than the Alpha variant [7].

Mutations can help viruses bind more tightly, which can cause them to become more transmissible [8]. These mutations have given the Delta variant an advantage over previous strains [6]. Researchers at the Guangdong Provincial Center for Disease Control and Prevention found that the Delta variant grows faster inside a person's respiratory tract and at a much higher level, which could help explain its ability to rapidly transmit [9]. Like the previous variants, the Delta variant is spread via respiratory aerosols or "airborne" and can be spread beyond 6 feet in certain situations, such as enclosed spaces [8]. The Delta variant has been detected in over 80 countries [10] and has quickly become the dominate variant in India, the United Kingdom, and now the United States [5, 11].

As different variants of the virus evolve, they may pose a threat on the efficacy of the vaccines currently available [12]. However, studies show that the current vaccines still provide protection against the Delta variant, although the effectiveness is lower.

Financial Times conducted a study on how the Pfizer/BioNTech, AstraZeneca, and Moderna vaccines compare for each variant against infection and hospitalization [13]. After two doses of the Pfizer vaccine, the effectiveness of protection against infection reduced from 93.4% with B.1.1.7 (Alpha variant) to 87.9% with B.1.617.2 (Delta variant) [12]. After one dose of the Pfizer vaccine, the effectiveness of protection against symptomatic infection provided 51% with B.1.1.7 (Alpha variant) to 33% with B.1.617.2 (Delta variant) [6].

Experts believe that the Moderna vaccine should have similar effects to the Pfizer vaccine since both vaccines use mRNA technology [14]. After two doses of the AstraZeneca vaccine, the effectiveness of protection against infection reduced from 66.1% with B.1.1.7 (Alpha variant) to 59.3% with B.1.617.2 (Delta variant) [12]. For the Johnson & Johnson (J&J) vaccine, there is currently little data on its efficacy against the Delta variant. Dr. Scott Gottlieb, a former U.S. Food and Drug Administration commissioner, stated that the J&J vaccine appears to be about 60% effective against the Delta variant compared to its 72% overall effectiveness before the mutations [15, 16]. However, a study was done on the J&J vaccine's effectiveness against the variants with a small number of participants. They found that the J&J vaccine protects against the SARS-CoV-2 variants of concern (including the Delta variant) for at least eight months [17]. It was noted that the level of neutralizing antibodies increased over time, helping to prevent

the virus from entering cells [18]. It is unknown yet whether a booster shot will be needed in the future.

Pfizer and AstraZeneca appear to have a high percentage of preventing hospitalization at 96% and 92% among those infected with the Delta variant, respectively [6]. Vaccination is key to preventing serious disease from the Delta and future variants.

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BIOGRAPHY

Deanna Milonas is a research analyst for the Homeland Defense and Security Information Analysis Center (HDIAC) for SURVICE Engineering Company, where she supports a specialized task order to analyze the impacts of the COVID-19 pandemic on DoD operations. Prior to working for HDIAC, she worked as an analytical chemist performing chemical analysis on samples using LC-MS, GC-MS, and ICP-OES. While working on her master's degree, she worked as a biomedical engineering researcher focusing on the synthesis and characterization of polymeric magnetic micro- and nanoparticles and their therapeutic applications for drug delivery. Deanne holds a B.S. in chemistry and an M.S. in biomedical engineering.