

Mutations and Viral Variants Galore_SARS-CoV-2

Objectives

- Recall the historical impact of previous infectious disease pandemics and differentiate between a disease that is pandemic and one that is endemic
- Outline the “to date” defined surface protein structure of SARS-CoV-2 and identify the areas of most concern in terms of viral entry into the cell and the location of mutations impacting virulence, mode of transmission, and host immune evasion
- List the recently noted emerging variants of concern (VOCs) including the recombination of two SARS-CoV-2 viruses and the combination of COVID-19 and other unrelated or non-novel version of SARS-CoV-2 viruses
- Describe the crucial aspects of COVID-19 vaccine strategy as well as the impact on vaccine efficacy that has been shown by the ongoing emergence of variants
- Contrast the discussion points presented suggesting that Omicron acting as a natural vaccine could serve as a possible harbinger of the pandemic’s end and the concerns expressed about the ongoing potential for emergence of additional recombinant viruses heralding more significant COVID-19 history

Content Outline

1. Overview of SARS-CoV-2 Mutations and their Viral Variants
 - 1.1 Description of SARS-CoV-2 structural properties and replication
 - 1.1.1 Entry into the cell
 - 1.2 Mutations in the spike (S) protein
 - 1.2.1 Characteristics of receptor-binding domain (RBD) mutations
 - 1.2.2 Important mutations in the RBD and other S protein domains
 - 1.3 SARS-CoV-2 variants by country with changes and effects on the virus
 - 1.4 Discussion of difficulties caused by SARS-CoV-2 mutations on targeted therapies and vaccine development
2. Moving Forward from the Delta Variant to Omicron and Beyond
 - 2.1 Delta (B.1.61.2) and its other mutations and variants of concern (VOCs)
 - 2.2 The evolution and course to date of Omicron (BA.1) and its sub-variants
 - 2.3 Comparison of Omicron to prior SARS-CoV-2 variants such as Delta
 - 2.4 COVID-19- vaccine strategy including efficacy against Omicron
 - 2.5 Overview of past pandemics and expectations for COVID-19
 - 2.6 Discussion of Omicron as a natural vaccine or as a potential trigger for dangerous super variants

Reading Material Resources

Module WB2459: Mutations and Viral Variants Galore_SARS-CoV-2 is based on the resources listed below. A copy of each resource is included with the module.

SARS-CoV-2 Mutations and their Viral Variants, Cosar B et al., *Cytokine and Growth Factor Reviews* 63 (2022), 10-22

Is Omicron the end of pandemic or start of a new inngs?, Das S et al., *Travel Medicine and Infectious Disease*, 48 (2022), Article 102332