



SARS-CoV-2 New Variants

Why in News

SARS-CoV-2 variants have emerged independently in several countries, and the latest research indicates that the virus is **changing quickly (mutation)** and it may continue to develop towards **evading currently available vaccines**.

- **SARS-CoV-2 virus** is responsible for causing the **coronavirus disease (Covid-19)**.

Key Points

▪ Meaning of Mutation:

- Mutation is **an alteration in the genetic material (the genome) of a cell** of a living organism or of a virus that is more or less permanent and that can be transmitted to the cell's or the virus's descendants.
- The genomes of organisms are all composed of **Deoxyribonucleic Acid (DNA)**, whereas **viral genomes** can be of DNA or **Ribo Nucleic Acid (RNA)**.

▪ RNA Mutation vs DNA Mutation:

- When cells multiply, the DNA within them **replicates** as well, to make **copies for the new cells**. During replication, **random errors** are introduced into the new DNA.
- While the errors in DNA virus genomes can be **corrected by the error-correcting function of cells in which they replicate**, there are **no enzymes in cells to correct RNA errors**. Therefore, **RNA viruses accumulate more genetic changes (mutations) than DNA viruses**.

▪ Significance of Mutation:

◦ Evolution:

- While **most mutations are deleterious to the virus**, if **some allow a selective advantage**, say **better infectivity, transmission, or escape from immunity** then the new viruses out-compete the older ones in a population.
- **For example:** A mutation called **D614G** emerged in January 2020 to change the **amino acid** at a position in the **coronavirus' Spike protein**.

- Because this variant infected and replicated better and produced **'fitter' viruses**, it now accounts for over 99% of the virus circulating globally. Other mutations are now emerging in this background.
- It is the **coronavirus spike protein** that binds to a **human protein** to initiate the **process of infection**.
- Changes here could **possibly affect how the virus behaves in terms of its ability to infect**, or cause severe disease, or escape the immune response made by vaccines.

▪ Distinct features of RNA Genome of Coronavirus:

- Coronaviruses have an RNA genome with two unique features:

- **Largest Genome:**

- At 30,000 nucleotides (nucleic acid units) they have the **largest genome among RNA viruses.**

- **Stability:**

- Coronaviruses have rather stable genomes, changing about a **thousand times slower than influenza viruses**, which too are RNA viruses that cause respiratory illness.

- **Recent RBD Mutations in Coronavirus Variants:**

- Three key **Receptor-Binding Domain (RBD)** mutations **K417N/T, E484K, and N501Y** are found in variants that emerged in **South Africa and Brazil.**

- The **UK variant** has the **N501Y, P681H** mutation.

- Viruses with mutations within the receptor-binding domain (RBD) of the Spike protein **have the most potential to evade antibodies** that develop as a result of natural infection or vaccination.
- The RBD binds the cellular receptor allowing the virus to infect cells, and anti-RBD antibodies neutralise the virus.

- **Vaccine Test Against Emerging Variants:**

- Indirect tests are done in laboratories to assess if an emerging variant might escape antibodies developed after a natural infection or vaccination.

- **Serum** (the blood components that contain antibodies) from recovered patients or vaccinated people, and **antibodies known to neutralise the original virus**, are tested to determine whether the variant viruses evade antibodies.
- The effectiveness of a serum or antibody is expressed as an **inhibitory concentration (IC) or plaque reduction neutralisation titer (PRNT) value.**
- The IC50 or PRNT50 value is the reciprocal dilution of serum or antibody that neutralises 50% viruses in the sample.

- **Efficacy of Vaccine Against Emerging Variants:**

- Both Moderna and Pfizer/BioNTech have agreed that their vaccines offered **reduced protection against the South African variant.** The two companies are reported to be working on **developing fresh vaccines** to cover these variants.
- There is also proof of **several re-infections** with the variant in South Africa, driven by the ability of new variants to evade immunity developed against the original virus.

- **India's Case:**

- Only the UK variant viruses have so far **been reported from India** and that too, in travellers. There is **no reported local transmission.**
- The evidence so far suggests that current vaccines would still **protect against the UK variant, even if with reduced efficacy.**
 - Scientists from **ICMR-National Institute of Virology** and **Bharat Biotech** tested serum from recipients of their vaccine, **Covaxin**, against a UK variant.
 - The results show no significant difference, suggesting that the vaccine would work equally well on the UK variant.
- With cases already going down, India should **strictly implement masks and limit crowds while aggressively tracing contacts of people infected with the UK variant.**
- India must also be vigilant of people with a history of travel to **South Africa since October 2020, and Brazil since December 2020.**
- The setting up of an inter-ministerial group 'Indian SARS-CoV-2 Genomics Consortium (INSACOG)' to **increase genomic surveillance** is a step in the right direction.

- **Genomic surveillance** can generate a rich source of information for tracking pathogen transmission and evolution on both national and international levels.

Source:IE

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