

Contributions of the Centre for DNA Fingerprinting and Diagnostics (CDFD) towards Diagnostics and Genomics research on COVID-19

COVID-19 Diagnostics:

- CDFD initiated RT-PCR based diagnostics of SARS-CoV-2 causing COVID-19 infection from 17th April 2020 by establishing a state of the art laboratory with a maximum testing capacity of 450 samples per day.
- More than 55,000 suspected patient samples obtained from various districts of Telangana have been analyzed so far. Identification of positive samples has helped the State Govt. in contact tracing and containment measures.

COVID-19 Genomics Research:

- We performed the first comprehensive study from the state of Telangana on the dynamics of SARS-Cov-2 genomic evolution observed during the period of early March to July, 2020.
- The complete genome sequence of >200 SARS-CoV-2 RNA samples was determined with the overarching objective of identifying unique mutations, in addition to determining the dominant viral lineages circulating in the population.
- The phylodynamic analysis of the sequences revealed a singularly high preponderance of the 20B lineage (also called as G/GR clade).
- A comprehensive analysis of the mutational landscape including high and low frequency variants revealed the presence of frequently mutated regions.
- Two distinct mutational clusters were detected within the 20B lineage. Unique missense mutations were identified in nsp3, nsp4, nsp5 and ORF3a, not identified elsewhere.
- The nsp3 region was found to harbor multiple synonymous and missense mutations, targeting the viral protease domain and nucleic acid binding region (NAR) domain.
- As part of the Indian SARS-CoV-2 genomics consortium (INSACOG) initiative, CDFD has sequenced 1541 SARS-CoV-2 genomes, collected from the states of Rajasthan, Himachal Pradesh, Punjab, Andhra Pradesh, Telangana and Manipur. These sequences have been submitted to the national data hub maintained at NIBMG, Kalyani, WB.
- CDFD has also been actively involved in sentinel SARS-CoV-2 genomic surveillance, towards which routine sample collection is performed from Telangana state designated sentinel laboratories including RT-PCR based testing labs and hospitals. These samples are then subjected to sequencing and subsequent lineage and variant analysis. The results of these analyses are shared with the State as well as with INSACOG.
- The analysis performed on Telangana SARS-CoV-2 samples collected by CDFD internally has revealed a consistent increase in the B.1.617 lineage since March 2021 onwards. Especially the B.1.617.2 (Delta) lineage has risen sharply since April 2021.
- As part of the internal sample collection strategy, special efforts have been undertaken to meticulously monitor and collect samples which are suspected and/or confirmed to be vaccination breakthroughs and reinfection cases in addition to sourcing samples from

sudden surge events. The genomic analysis of such samples are expected to shed light into possible mechanisms of viral immune escape.

Publications:

A Gupta, R Sabarinathan, P Bala, V Donipadi, D Vashisht, MR Katika, M Kandakatla, D Mitra, A Dalal, MD Bashyam. A comprehensive profile of genomic variations in the SARS-CoV-2 isolates from the state of Telangana, India. *J Gen Virol*; 2021; 102:001562.