



## क्षेत्रीय जैवप्रौद्योगिकी केन्द्र

# REGIONAL CENTRE FOR BIOTECHNOLOGY

## COVID-19 RELATED RESEARCH ACTIVITIES AT RCB

### Research group of Prof. Deepak T. Nair

Laboratory of Genomic Integrity and Evolution, Regional Centre for Biotechnology

The following research activities are underway regarding SARS-CoV-2, the causative agent of the ongoing COVID19 pandemic:

1. The nsp12 protein houses the RNA-dependent RNA polymerase activity responsible for the duplication of the RNA genome of the SARS-CoV-2 virus. We have used computational tools to build a homology model of the three-dimensional structure of the nsp12 protein. The model was then used to identify possible inhibitors of the nsp12 protein. Our studies predict that the methylcobalamin form of Vitamin B12 may bind to the active site of the nsp12 protein and inhibit its activity. Further experiments have to be carried out to validate this hypothesis. If found effective, methylcobalamin may be immediately deployed in the field since it is already a part of many drug formulations.
2. We have initiated efforts to purify the nsp12 protein to develop high throughput plate assays that can be used to identify different inhibitors of the protein. These inhibitors will serve as lead molecules for the development of novel drugs against the SARS-CoV2 virus.
3. Efforts are underway to identify possible inhibitors of two other proteins from the SARS-CoV-2 virus using computational tools. These include nsp14, which has a methyltransferase and exoribonuclease activity and nsp13 which has a RNA helicase activity.
4. The available genome sequences of SARS-CoV-2 are being analysed to identify regions in the genome which may be structured and can be targeted using small molecule to perturb translation or replication of the genome.

Overall, intense efforts are ongoing to identify possible inhibitors of the SARS-CoV-2 life cycle and already a promising lead molecule has been identified. The availability of live virus to carry out experiments that can validate the computational studies will considerably bolster the efforts at RCB to unearth a drug for the ongoing pandemic.

## BBB Covid-19 Projects

### Project 1: Company- SHCShine Biotech (Dr. Priyanka Maurya)

Title: Development of highly sensitive & specific, rapid, point-of-care, low-resourcerequiring, colorimetric and cost-effective test for COVID-19 detection

Summary:

Since the treatment is unknown yet, diagnosis/identification of the infected subject and their isolation from the community has been proposed to be one of the effective approaches to prevent COVID-19 progression and its control. However, clinical manifestation of COVID-19 infection (fever, cold, cough and difficulty in breathing) is highly non-specific and hence clinical-diagnosis remains challenging. So far, the nucleic acid detection (RT-PCR) based diagnostics (i.e. Realstar SARS-CoV-2 RT PCR, Real time detecting 2019-nCoV and SARS-CoV-2 (RT-qPCR) detection kit) using the nasal and throat swab sampling has been the golden method for the purpose. PCR allows the detection of infection several weeks before it is possible to detect antibodies; but PCR-based screening involves complicated sample preparation & processes and requires expert users & high resource and Hence not the diagnostic of choice for the purpose.

In this proposal, the aim is to develop a highly specific and sensitive, affordable and fielddeployable test for diagnosis of COVID-19 infection using Loop-mediated isothermal amplification (RT-LAMP)-based technology.

Briefly, the proposed diagnostics would consists two key components/products

1. Development of a membrane-based cartridge for rapid capture and isolation of viral RNA from clinical specimen (nasal swab).
2. Single-step amplification of membrane-bound viral RNA using RT-LAMP and its simultaneous detection with colorimetric dyes for COVID-19 diagnosis

The proposed test is expected to be highly sensitive & specific, rapid, point-of-care, lowresource-requiring and cost-effective diagnostic test for COVID-19.

## Project 2: Company - Bioheaven ( Dr. Shailendra Vyas)

Title : Development of probe based RT PCR diagnostics kit for detection of Covid19 (SARSCov2)

Summary :

There is an acute shortage of quality diagnostics testing material not only in India but across SE Asia. Since there are currently no specific treatments for coronavirus infections, and strains of these RNA viruses evolve rapidly, it is crucial to develop novel techniques that can provide rapid diagnostics and therapeutic inte

Specific objectives :

Objective-1: SARS-Cov2 Diagnostics Test Kit Composition

Objective-2: Testing the kits components using known controls and Sensitivity/Specificity Identification

Objective-3: Performance evaluation with accredited labs on positive samples and getting licences

### Project 3: Company - InnoDx ( Dr. Sandeep Verma )

Title : Rapid molecular diagnostic kit development for COVID-19.

Summary :

To develop Loop-mediated isothermal amplification (LAMP) and Real-time PCR (RT-PCR) kits for COVID-19 detection. These molecular test kits will be the accurate solution for diagnosis of COVID-19 as they will be manufactured in India without any compromise on quality of the tests. LAMP kits can be stored at 2-8 C and are in lyophilized format to reduce the steps and time. There is a dire need of such a simple kit for COVID-19 detection for mass screening. This kit will be the First Indian kit for COVID-19 detection based on LAMP technology and has potential for mass screening due to its ease of use and cost-effectiveness in a high throughput manner.

Specific objectives :

Objective-1: Development of COVID-19 RT PCR kit.

Objective-2: Development of COVID-19 LAMP kit.

## Project 4: Company - NGIVD ( Dr. Suresh Thakur)

Title : Development of PCR based IVD kits for the diagnosis of SARS-COVID19.

### Summary:

There is urgent need to have optimized quality testing and standard operating procedure for SARS-CoV-2 infection. SARS-CoV2 uses ACE2 as viral receptor. It is recommended that samples from lower respiratory tract of the patients, including sputum and BALF, nasopharyngeal swab. To reduce FNR further use of TRIZOLIS proven to have stability of RNA samples and inactivation of virus, sample transport condition, and laboratory practice standard. There is urgent need to have serum-based testing methods, for example, detection of SARS-CoV-2-specific immunoglobulin M and antigens from patients' sera or swab.

Objective-1: Development of prototype for qRT-PCR kits using synthesized primers and probes

Objective-2: Development of prototype for LAMP-PCR kits using synthesized primers and probes

Objective 3 Evaluation of sensitivity and specificity of Prototype kit by comparing with existing commercial kits.