

# Regional Workshop on New paradigms of innovation and technology to address the challenges of COVID-19 pandemic

APCTT, United Nations Economic and Social Commission for Asia & the Pacific and  
Ministry of Innovative Development, Republic of Uzbekistan

3 November 2020

## Role of academic institutions in the development of innovative technologies to respond to COVID-19

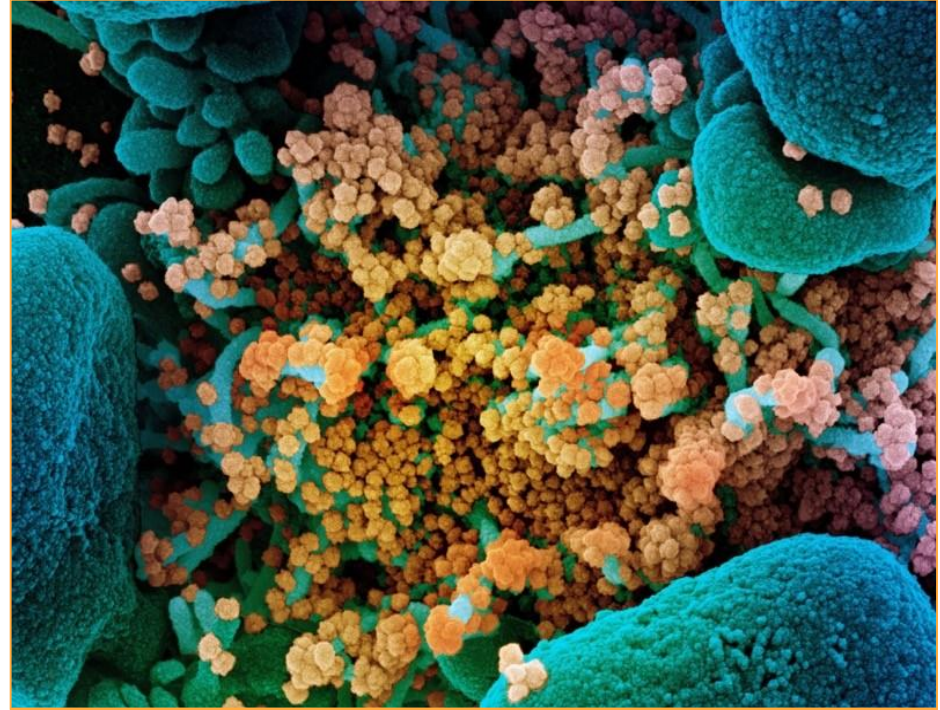
Rakesh Mishra



The COVID-19 pandemic has become the worst public-health crisis in a century.

In just 10 months:  
45 million cases  
1.18 million deaths  
and counting...

It also catalysed a research revolution to understand the virus: **SARS-CoV-2**



A colorized scanning electron micrograph of a cell (green) heavily infected with particles (orange) from the virus that causes COVID-19, isolated from a patient sample. Credit: NIAID/NIH/SPL

**Why should the academic institutions respond?**

**What can be done?**

**The assets:**

**Strengths of basics of science**

**Young sharp minds**

**Not just technical- questioning and innovating**

**Trained to deal with the uncertain/unexpected**

**Their enthusiasm**

# When a new infection arrives: what do we need to do immediately?

## Detection and Diagnosis:

accessible, feasible, high throughput,... methods

## Controlling the spread:

technical, behavioral, governmental,... interventions

## Associated issues:

new normals, information/policy,... ideas

**Considering the scientific and technical context, academic organizations  
must take initiative, innovate and contribute.**

# Communicating the unknown

**Keeping politicians, policymakers, academic peers, media & general public informed**

**In times of uncertainty, it becomes extremely important for people to have credible sources of information.**

**Scientists hold an extremely important role during the crisis, and hence it has been more important than ever to be accessible.**

**Also new information is coming out every few days. So, it is important to have a continued discussion with media, policymakers and public to give them the best suggestions for that time.**

# Multiple roles of CSIR-CCMB in fight against COVID-19

Our students' contributions are many fold

Testing center

Training center

Validation center

National repository (virus and patient samples)

**Culturing the virus in lab to enable:**

**Testing/screening of drugs**

**Testing/validation of devices**

**Developing diagnostic methods, protocols, SOPs**

**Genome dynamics of the virus**

**Understanding the biology of the virus**

# Training for testing

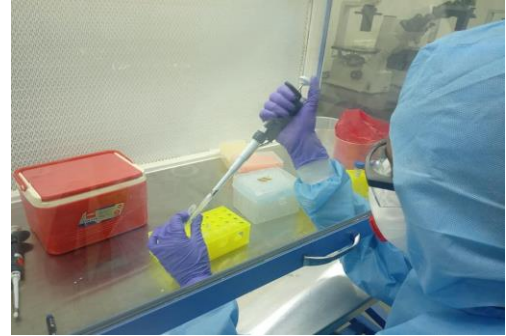


**Training staff and students from research/academic institutions**

**Training doctors from government/private hospitals**

**SOPs and training videos to establish new testing centres**

# Testing for COVID-19

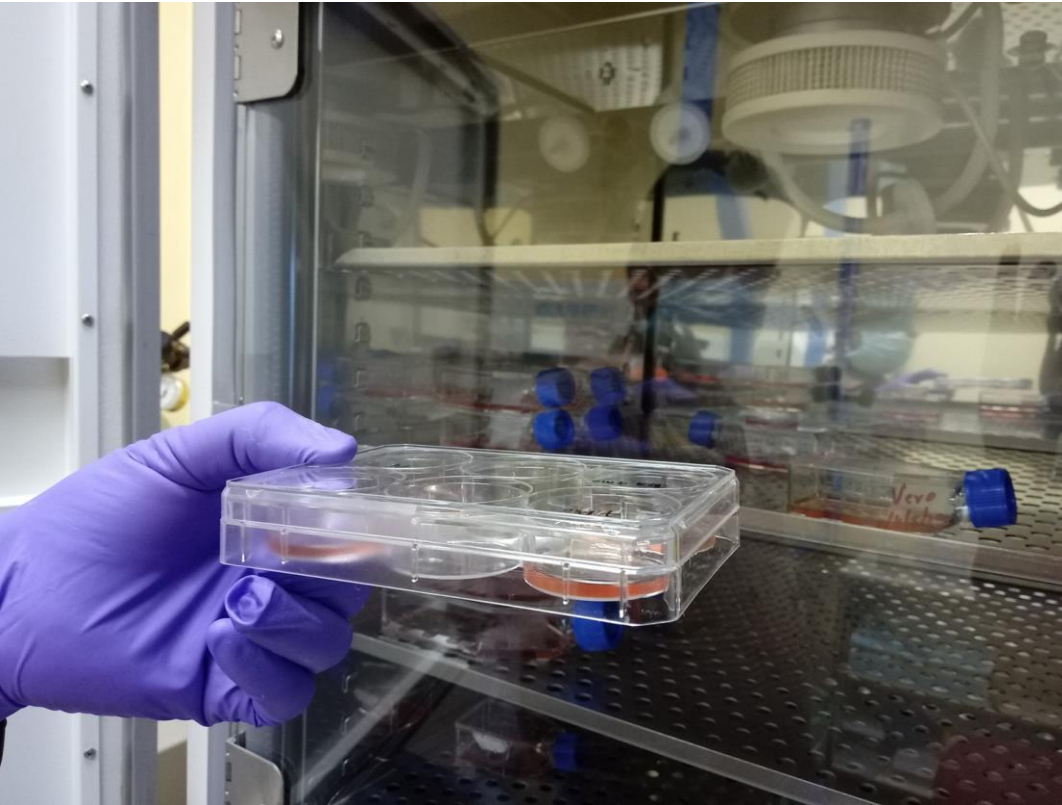


**One of the early labs to get involved and continuing...**

**Improvements:**

**Reduce VTM volume**

**Pooling of samples from low prevalence areas**



**Development of various therapeutics on cell-culture based platforms**

# Growing coronavirus

## Understanding the biology

- Testing potential drugs, etc.  
(>25 drugs, etc., tested)  
(one nutraceutical in the market)
- Evaluate sanitization strategies  
(Several devices, etc., validated)
- Development of antisera  
Vaccines  
Neutralizing antibodies  
(Entering human trial next month)



# Developing newer ways to test

## The Dry Swab method

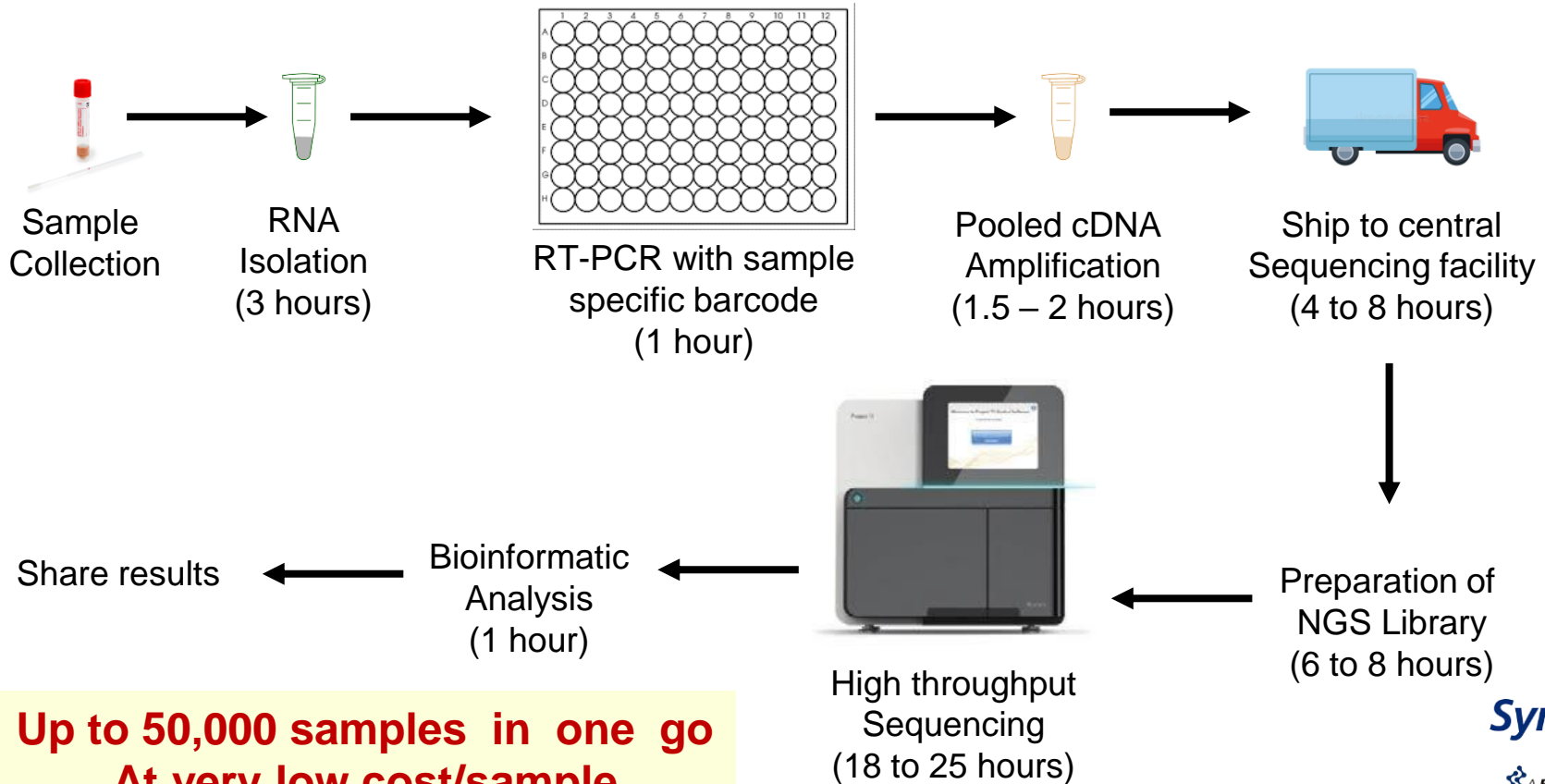
Method variants	Distinguishing features			Sensitivity	Comment
	Swab in VTM	Dry swab & TE(Pro-K)*	RNA extraction		
Current gold standard	Swab in VTM	Dry swab & TE(Pro-K)*	RNA extraction	70-80%	Accepted by ICMR
Dry Swab	Swab in VTM	Dry swab & TE(Pro-K)*	RNA extraction	70-80%	Safer, 50% cheaper, 4-5x higher throughput. Proposed alternative of current method

This method omits the RNA extraction step and is recommended with ICMR approved RTqPCR kit

- RNA Extraction Free and Direct RT-PCR
- No new equipment or reagents needed
- With the current manpower and funds up to 3-4 times more testing can be done with this method
- Safer to handle as no liquid during transportation
- Half the cost and half the time



# NGS based COVID19 Diagnostics - Strategy



# Genome dynamics of the virus

Monitoring the spread of the virus  
NGS-based approaches



## GEAR-19

Genome Evolution Analysis Resource  
for COVID-19  
BIC, CSIR-CCMB

Genomes Sequenced

3154

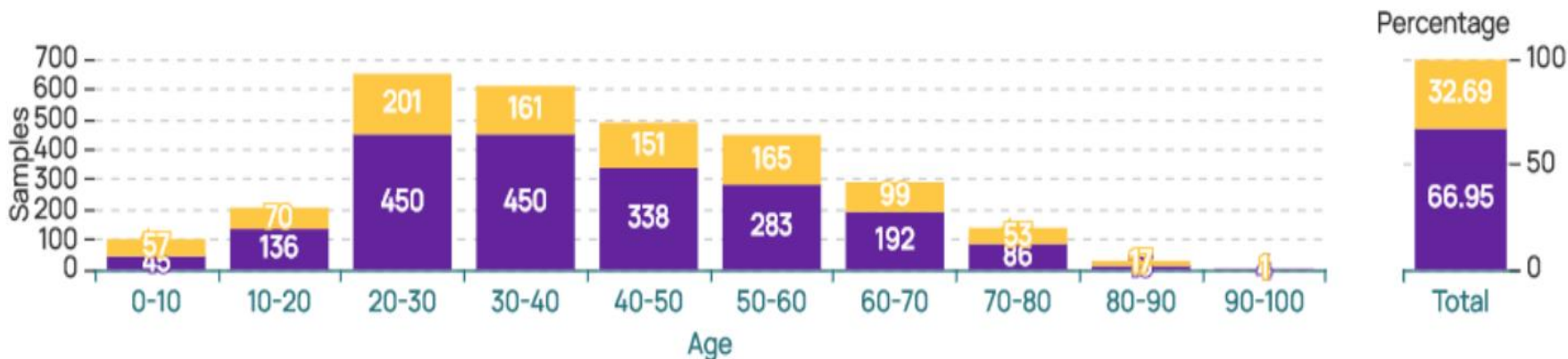


Variants Catalogued

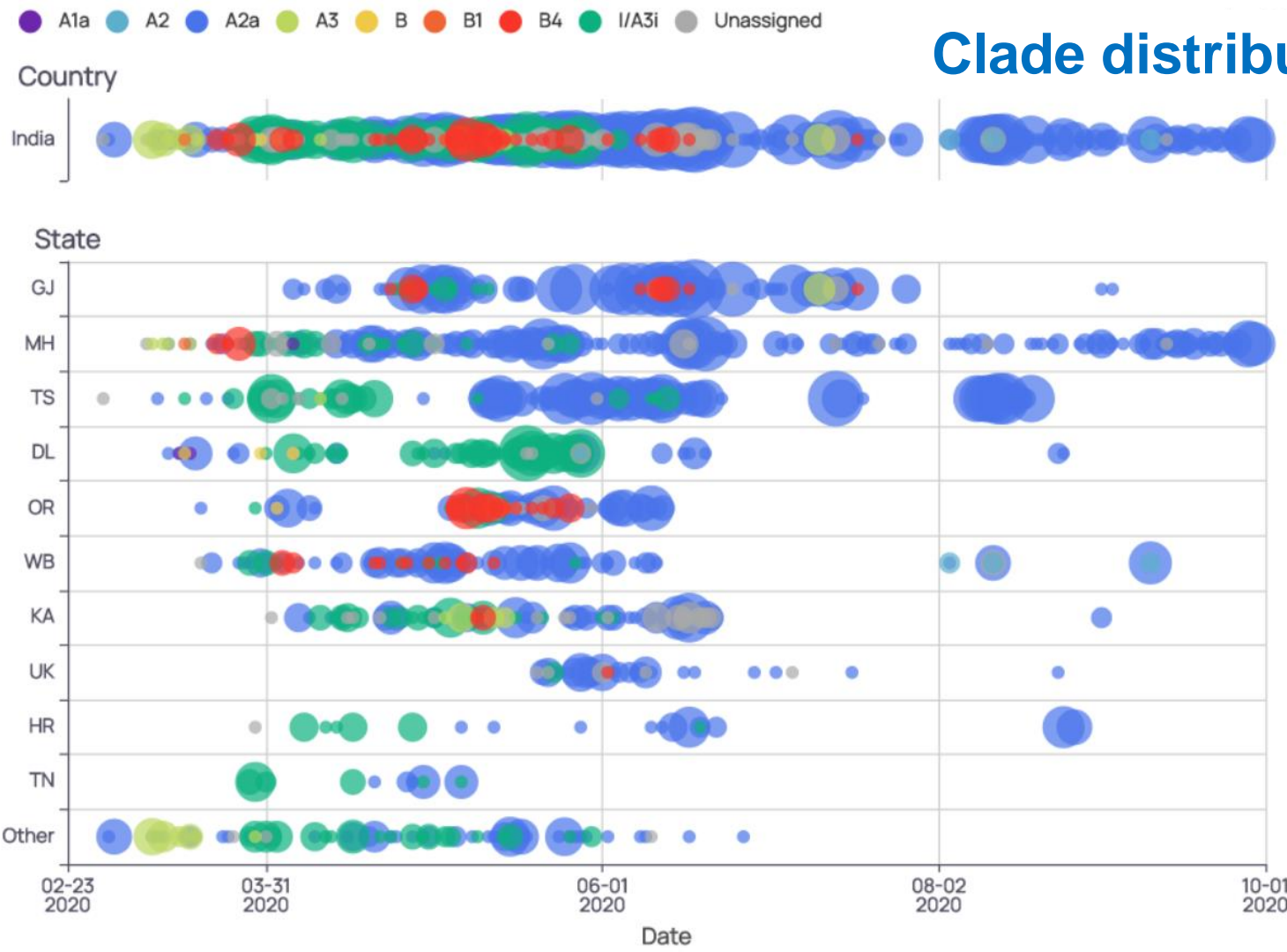
4493



Male Female Unknown



# Clade distribution timeline



**A3i clade was the prevalent March/April**

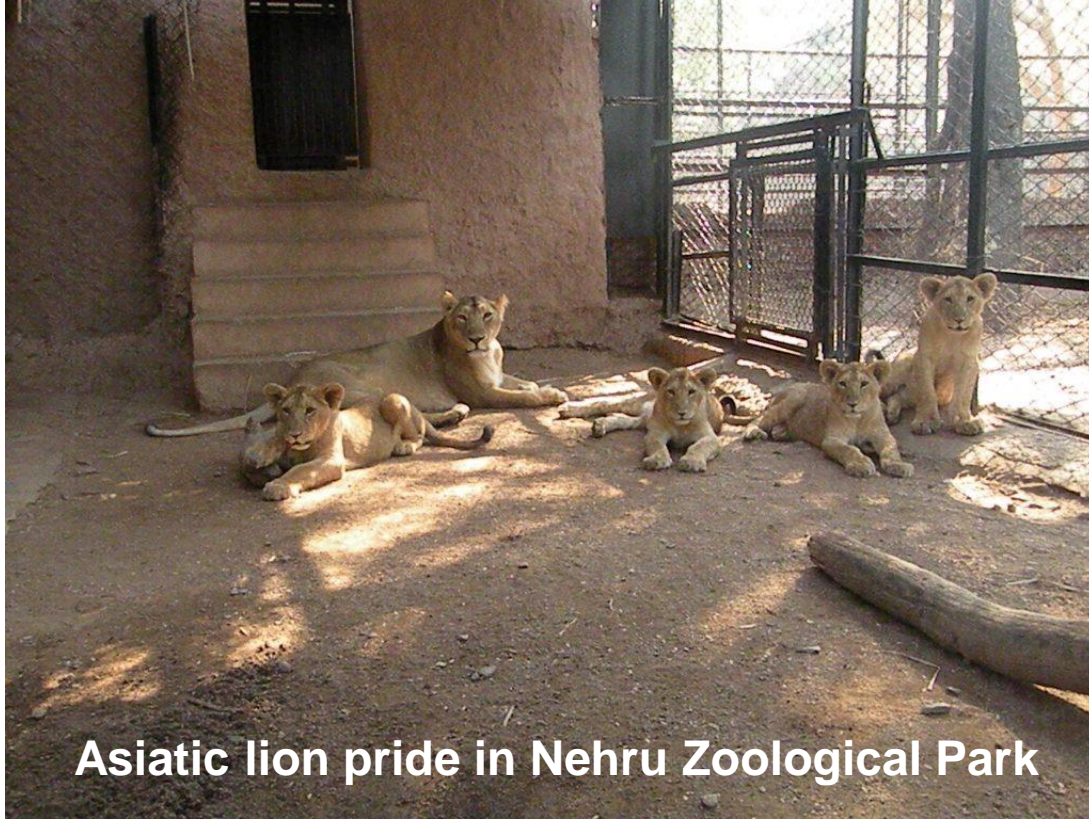
**A2a is the current prevalent clade**

**A3i is now non-existent**

Clade	Prevalence
A2a	74.51%
I/A3i	16.07%
B4	2.73%
Others	1.81%
?	4.88%

**Novelties... innovations...**

## **SARS CoV-2 testing in zoo**



**Asiatic lion pride in Nehru Zoological Park**

**Hyderabad Zoo is the coordinating conservation breeding of Asiatic lions in the country**

**5.5 years old lioness  
Sickness/symptoms  
Suspected of COVID-19  
Zoo keeper diagnosed +ve**

**CZA approached CCMB  
sample collection  
testing  
resolved**



# COVID-19 Surveillance: Air & Water

## Air sampling - viral load estimation

Air sampler gelatin filters:

ICUs, nurse rooms,  
Covid ward  
hospital corridor

~4 feet from patients



Traces of virus were detected in the  
air samples from ICU and Covid ward

## Effluent based epidemiological study



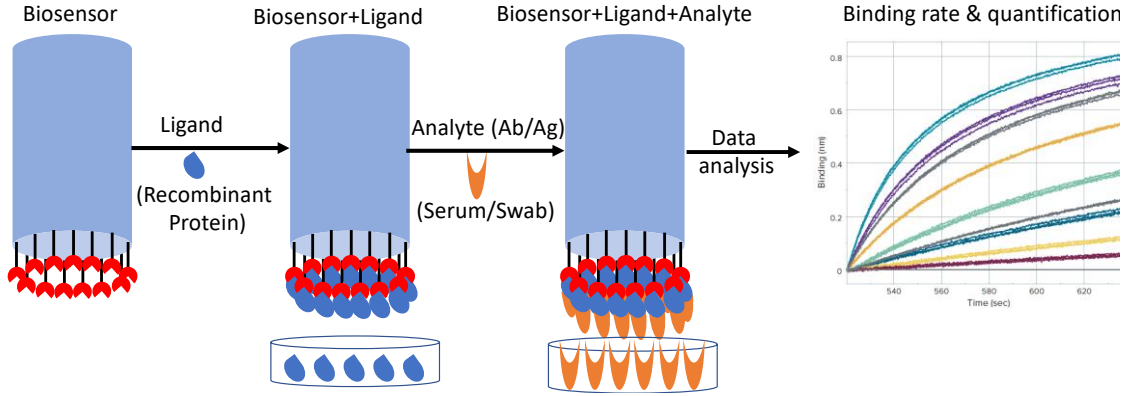
CCMB & IICT collaboration

# Novelties... innovations...

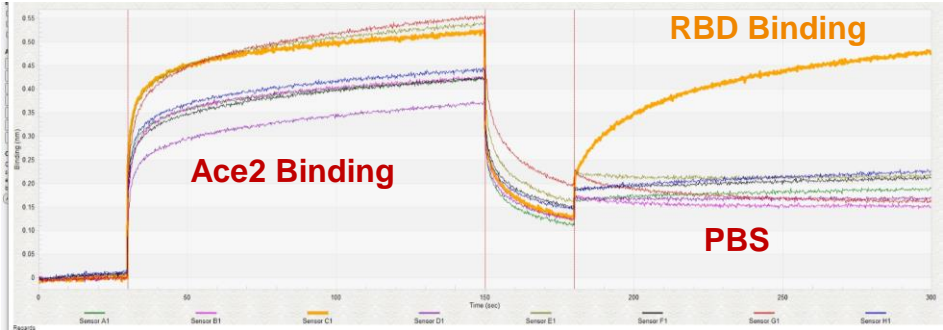
## Identification and quantification of total Ab or antigen specific to SARS-CoV-2



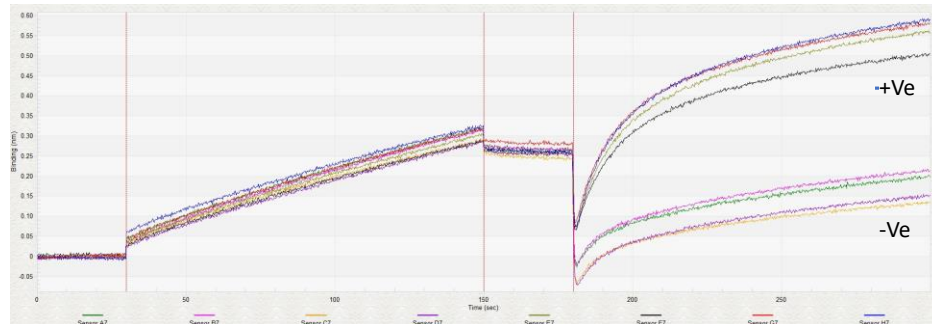
Developed on a FortBio Octet Platform [Bio-Layer Interferometry]



### COVID Antigen Binding



### Antibody detection in blood



# What do we need for future readiness?

**Disease Surveillance:**      **Vectors (flies, mosquitos, ...)**  
   **Parasites (virus, protozoa, bacteria,...)**  
   **Surveillance through air & water**

**Zoonotic Disease Surveillance:**  
   **Increasing 'wildlife-people' contacts**  
   **Cattle-people contact**  
   **Consumption of wildlife substances**

**Quick diagnostics:**      **Preparedness**  
   **Quick adaptation**  
   **Indigenization**

**Academic organizations must accept the challenge and take initiatives.**



# Need of the hour

Educate to fight fear mongering, superstitions and stigma

can we do something here?

Massive testing, tracking, isolating and 'the social vaccine'

can we do something here?

Goal oriented R&D and uphold public trust in science

can we do something here?

Consider no drug, no vaccine, no magic...

# The available Social Vaccine:



**Mask**

(simple cloth masks, worn properly)

**Social/physical distancing**

(avoid confined environment)

**Frequent hand wash with soap**

(disinfectant is second best)

