ICMR-NICED

ACHIEVEMENT & ACTIVITY REPORT

2020-21

आई.सी.एम.आर – राष्ट्रिय कॉलरा और आंत्र रोग संस्थान

ICMR-National Institute of Cholera and Enteric Diseases

स्वास्थ्य अनुसंधान विभाग / Department of Health Research

स्वास्थ्य और परिवार कल्याण मंत्रालय / Ministry of Health & Family Welfare

भारत सरकार / Government of India

कोलकाता / Kolkata - 700 010

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The Achievement & Activity Report
was compiled by the following editorial team

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The scientific content of this report belongs to the individual scientist and does not reflect the view of the editorial team.

From the Director's desk

It was early 2020, the whole world was reeling with the devastating COVID-19 pandemic with no vaccine, no definite treatment and above all, little available knowledge about the disease and the virus SARS-CoV2. COVID diagnostics were in its infancy and extreme limitation of laboratories that could handle the COVID samples. Keeping all the obstacles aside, on the directives of ICMR, the dedicated research organization ICMR-NICED initiated providing services to the people of Eastern India including West Bengal through its Regional Virus Research Diagnostic Laboratory (VRDL). NICED was the first lab in the Eastern India to become operational since February 2020 for providing diagnostic services for COVID-19 infection. From sample testing for SARS-CoV2 to kit validation, from training of laboratory staff to vaccine trials, ICMR-NICED has contributed significantly in India's fight against COVID-19 during 2020 to 2021.

NICED-VRDL has worked relentlessly (24x7 hrs) not only for diagnosis of COVID-19 infection but also for training of Lab personnel from the Government and non-Government organizations on RTPCR testing and performing regular quality control check and assurance activities to maintain the testing standard of the labs in the state of West Bengal. During the early phase, NICED-VRDL also provided diagnostic support to Jharkhand, Odisha, Sikkim and North-Eastern states of India. ICMR-NICED was designated as (1) one of the ICMR's validation centers for COVID-19 molecular diagnostic kits and as (2) Central and Regional Depot for receiving, storage and distribution of diagnostic kits and reagents in Eastern India. To cope with the demand for testing large number of samples for COVID-19, COBAS 8800 machine was installed at ICMR-NICED in August 2020 by Honorable Prime Minister, under the aegis of the Ministry of Health and Family Welfare, Government of India, increasing the daily capacity of sample testing upto 3000 samples per day. NICED was also associated with relevant research activities like pan India sero-surveillance of COVID-19, the result of which was used in making strategic plan for vaccine delivery against COVID -19. This institute has participated in rBCG Vaccine Trial, COVAXIN Phase III Trial, mRNA vaccine trial against COVID-19 infection.

During the reporting period, ICMR-NICED also continued regular research activities, important for public health. National Surveillance System for Enteric Fever in India brought out the typhoid incidence at the national level. Available vaccines against Rotavirus (Rotavac and Rotasiil) could be safely used in an interchangeable manner for routine immunization program indicating the flexibility in administering the vaccines. This finding could be of immense value to address vaccine shortages and supply chain issues. NICED also contributed in strengthening evidence-based advocacy for influenza prevention and control in India; in developing environmental surveillance strategy for typhoid; in developing vaccines against enteric bacteria like *Salmonella*, *Shigella*, *V. cholerae* and in determining the safety, immuno genicity and efficacy of the candidate vaccines in animal models through collaborative activities with the national and international academic/research institutions of repute. Other important research agenda for NICED remains developing diagnostic assays through laboratory research to identify the causative agents of cholera, viral diarrhea, hepatitis, typhoid fever, neonatal sepsis and antimicrobial resistance (AMR).

A total of 76 articles, 3 book chapters with average impact of 5.503 and with highest citation being172 were published during 2020-2021. A total of 57 extramural projects were being under taken which were funded by national/international funding agencies.

ICMR-NICED is dedicated towards capacity building at the national level for biomedical research. A total of 62 PhD students, 8 post-doctoral trainees and 15 Master's students were trained and 12 numbers of Trainings / workshops were held at the Institution during 2020-2021.

In the glorious journey of 60 years, ICMR-NICED has been working relentlessly on the important public health problems including diarrhoeal diseases. Now, with the changing paradigm of diseases and therapeutics, ICMR-NICED is committed to accept newer challenges and serve the nation for developing self-reliant healthcare strategies with cutting edge technology and research.

Shanta Dutta
Director

CONTENTS

S. Dutta (Principal Investigator), Bacteriology Division

Studies on Multidrug Resistant *Salmonella* Typhi isolates from Kolkata

Investigators : Dr. Shanta Dutta & Sriparna Samajpati

Enteric fever caused by antimicrobial resistant *Salmonella* Typhi isolates still pose a great threat on the use of current antibiotics for the treatment of enteric fever. Ceftriaxone and azithromycin have been increasingly used as alternative drugs of choice, after the emergence of MDR (multidrug resistance) and fluoroquinolone resistant *S*. Typhi isolates. In this study a total of 15 *S*. Typhi blood isolates were collected from two hospitals in Kolkata during the period of April 2020-March 2021 (Apollo Gleneagles, 10 and CMRI, 2) and subjected to antimicrobial susceptibility testing by disc diffusion method. Because of the current COVID-19 pandemic situation and nationwide lockdown, the strain collection during this period was comparatively less than the earlier years. All *S*. Typhi isolates showed resistance to nalidixic acid, whereas 73.3% (11/15) showed decreased susceptibility to ciprofloxacin. Resistance to ciprofloxacin were found in 26.7% (4/15) of *S*. Typhi study isolates. Whole genome sequencing (WGS) of nine representative antibiotic resistant *S*. Typhi strains from Kolkata was carried out. Among the isolates, one (KOL445) was resistant to cotrimoxazole, tetracycline and streptomycin (QTS), two (KOL463, KOL496) were resistant to cotrimoxazole and chloramphenicol (CQNaDCS) and six (KOL127, KOL171, KOL202, KOL358, KOL429 and KOL432) were resistant to ampicillin, cotrimoxazole, chloramphenicol and streptomycin (MDR, multidrug resistance phenotype, ACQNaDCS). All the isolates except one (KOL445) showed decreased susceptibility to ciprofloxacin. Genomic analysis details are given in the Table. Fragment of IncF1B plasmid replicon was found in those strains carrying 180 kb plasmids (KOL171, KOL202, KOL358, KOL429, KOL432, KOL 463 and KOL496) except the KOL127 and KOL445 in which plasmids were absent. The presence of seven antimicrobial resistance genes, *catA1*, *bla*TEM-1, *dfrA7*, *sul1*, *sul2* and the class 1 integron with insertion of *IS1* element between chromosomal gene STY3618 and STY3619 near *cyaA*gene depicts the chromosomal translocation of these seven AMR genes in the MDR study strains (KOL127, KOL171, KOL202, KOL358, KOL429 and KOL432) (Fig 1). One *S*. Typhi strain in this study (KOL445) carried *sul1*, *dfrA5* and *tetB* genes. Interestingly this isolate had a MIC value 12µg for azithromycin (susceptible) and had a chromosomally integrated *ereA* gene (macrolide resistance) (Table 1).To our knowledge this is the first report on *ereA* gene being present in the *S*. Typhi strain from Asian countries. All the study strains belonged to H58 haplotype (4.3.1.1) except KOL445, which belonged to nonH58 haplotype (3.0.2) which was again rare. Majority of drug resistant *S*. Typhi isolates were due to the dissemination of specific lineage H58 across Asian and African countries.This study highlighted the importance of introduction of WGS technology for close monitoring of various molecular mechanisms of AMR in *S*. Typhi Kolkata isolates. The whole genome sequence of the study isolates has been deposited in the NCBI sequence read archive under the bio project (PRJNA623257).

Table1. AMR profiles and Genomic details of haplotype, MLST (Multi locus sequence type), AMR genes plasmid and QRDR (Quinolone resistance determining region) mutation for *S.* Typhi study isolates

Sl. no.	Sample ID	AMR profile	Haplotype	AMR genes	Plasmid	QRDR Mutation (gyrA)	MLST Type
1	KOL127	ACQSNaDCS	4.3.1.1	*Tem1*, *CATA1*, *sul1*, *sul2*, *dfrA7*, *strA*, *strB*	No plasmid	S83Y	ST1
2	KOL171	ACQSNaDCS	4.3.1.1	*Tem1*, *CATA1*, *sul1*, *sul2*, *dfrA7*, *strA*, *strB*	IncF1B	S83F	ST1
3	KOL202	ACQSNaDCS	4.3.1.1	*Tem1*, *CATA1*, *sul1*, *sul2*, *dfrA7*, *strA*, *strB*	IncF1B	S83Y	ST1
4	KOL358	ACQSNaDCS	4.3.1.1	*Tem1*, *CATA1*, *sul1*, *sul2*, *dfrA7*, *strA*, *strB*	IncF1B	S83Y	ST1
5	KOL429	ACQSNaDCS	4.3.1.1	*Tem1*, *CATA1*, *sul1*, *sul2*, *dfrA7*, *strA*, *strB*	IncF1B, IncQ1	S83Y	ST1
6	KOL432	ACQSNaDCS	4.3.1.1	*Tem1*, *CATA1*, *sul1*, *sul2*, *dfrA7*, *strA*, *strB*	IncF1B	S83Y	ST1
7	KOL445	QTS	3.0.2	*dfrA5*, *sul1*, *tetB*, *ereA*	No plasmid	No mutation	ST2
8	KOL463	CQNaDCS	4.3.1.1	*CATA1*, *sul1*, *sul2*, *dfrA7*, *strA*, *strB*	IncF1B	S83Y	ST1
9	KOL496	CQNaDCS	4.3.1.1	*CATA1*, *sul1*, *sul2*, *dfrA7*, *strA*, *strB*	IncF1B	S83Y	ST1

Abbreviation: A, ampicillin; C, chloramphenicol; S, streptomicin; Na, nalidixic acid; DCS, decreased susceptible to ciprofloxacin

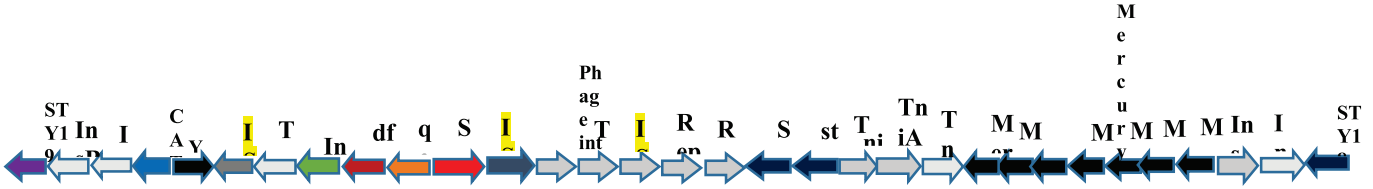

Fig 1. Position of the seven AMR genes responsible for MDR (resistant to ampicillin, chloramphenicol and cotrimoxazole) phenotype in *S.* Typhi isolates.

Carbapenem Resistance in Gram-negative bacteria of Enterobacteriaceae family isolated from sepsis patients admitted in Intensive Care Unit of Tertiary care Hospitals in Kolkata

Investigators : Dr. Shanta Dutta & Gourab Halder

Bacterial Sepsis due to Gram–negative bacilli (GNB) is widespread in nature and prevalent more in developing countries. The aim of this study was to determine the prevalence of common GNB like *Klebsiella pneumoniae, Escherichia coli, Pseudomonas aeruginosa* and *Acinetobacter baumannii* causing sepsis and to determine their antimicrobial resistance (AMR) profiles, mechanism of AMR and the molecular sub-types of GNB isolated from sepsis patients admitted in the Critical Care Unit (CCU) of three tertiary care hospitals in Kolkata.

A total of 317 non-duplicate CR-GNB, isolated from three different tertiary care hospitals during Jan-Dec 2018, were included in this report. Out of 317 isolates, 77.60% (n=246) belonged to *Enterobacteriaceae* (CRE) family, 15.14% (n=48) were *Acinetobacter spp*. and 7.25% (n=23) were *Pseudomonas spp.* Among CRE (n=246) isolates, CR-*Klebsiella pneumoniae* was predominant (n= 195; 195/246=79.26%)followed by CR-*E.coli*(n=28, 28/246=11.38%).The distribution of various CRE isolated from the hospitals are shown in Fig 2.

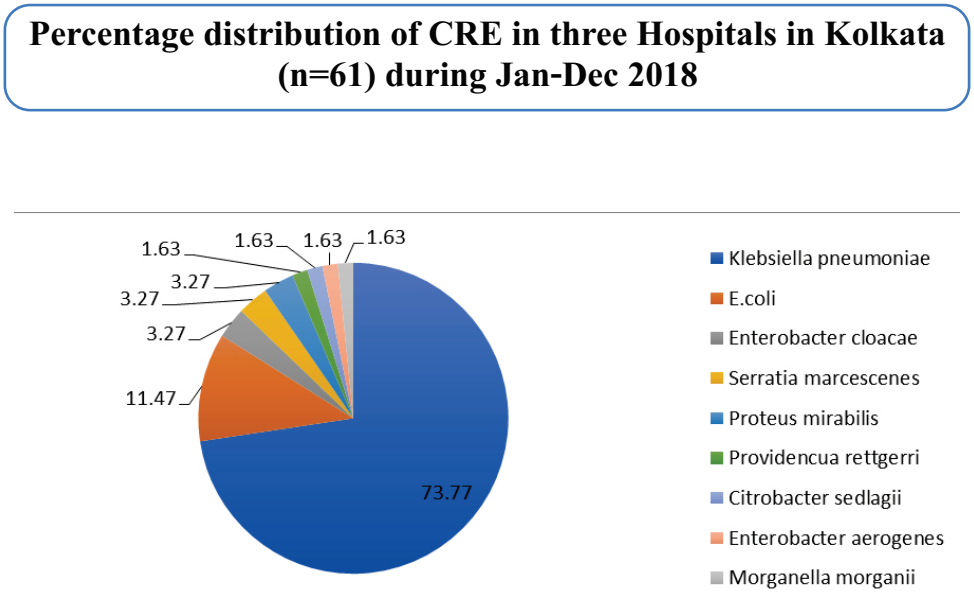

Fig 2. The distribution of CRE isolated from different hospitals (Jan-Dec 2018).

The MIC_{90} range of carbapenam for the CRE isolates were 128 -512µg/ml and MIC_{90} of colistin was 64 - 128µg/ml. Among CR-*Klebsiella*, OXA-48 like carbapenemase and TEM-1were predominant, while in CR-*E. coli* NDM-1 and TEM-1 were predominant. The presence of important genes in CR-*Klebiella* isolates(n=195) and CR-*E.coli* isolates (n=28) duringJan-Dec 2018 are shown in Table 2 and Table 3 respectively. Molecular Typing of CR-*Klebsiella* pneumonia (n=67) by PFGE showed heterogeneous (38.4% Co-efficient of similarity) strains in circulation (Fig 3).

Table 2. The predominant AMR genes present in CR *Klebiella* isolates (n=195) from Hospitalized patients during Jan-Dec 2018

Hospitals	Predominant AMR genes					
	NDM	OXA-48	KPC	SHV	TEM	CTX-M
Hosp no. 1	17 (8.71%)	100 (51.28%)	2 (1.02%)	163 (83.58%)	163 (83.58%)	156 (80%)
Hosp no. 2	43 (22.05%)	182 (93.33%)	13 (6.66%)	152 (77.77%)	152 (77.77%)	152 (77.77%)
Hosp no. 3	39 (20%)	156 (80%)	20 (10.25%)	78 (40%)	185 (94.87%)	117 (60%)

Table 3. The predominant resistance genes present in CR *E. coli* isolates (n=28) from Hospitalized patients during Jan-Dec 2018

Hospitals	Predominant AMR genes				
	NDM	OXA-48	SHV	TEM	CTX-M
Hosp no. 1	1 (3.57%)	5 (17.85%)	9 (32.14%)	25 (89.28%)	14 (50%)
Hosp no. 2	24 (85.71%)	28 (100%)	8 (28.57%)	71.42%	12 (42.85%)
Hosp no. 3	14 (50%)	Nil	14 (50%)	28 (100%)	14 (50%)

The emergence of carbapenem resistance in bacteria belonging to the *Enterobacteriaceae* is a considerable burden on the healthcare system with respect to the treatment of sepsis patients. A high percentage of carbapenemase (*NDM-1 and OXA-181)* and ESBL (*CTX-M-15*) producing organisms were isolated in this study. Therefore, routine screening for carbapenem resistant bacteria is mandatory especially in the hospital settings and prudent use of antimicrobials in the hospitals through stewardship program is recommended to reduce the burden of antimicrobial use.

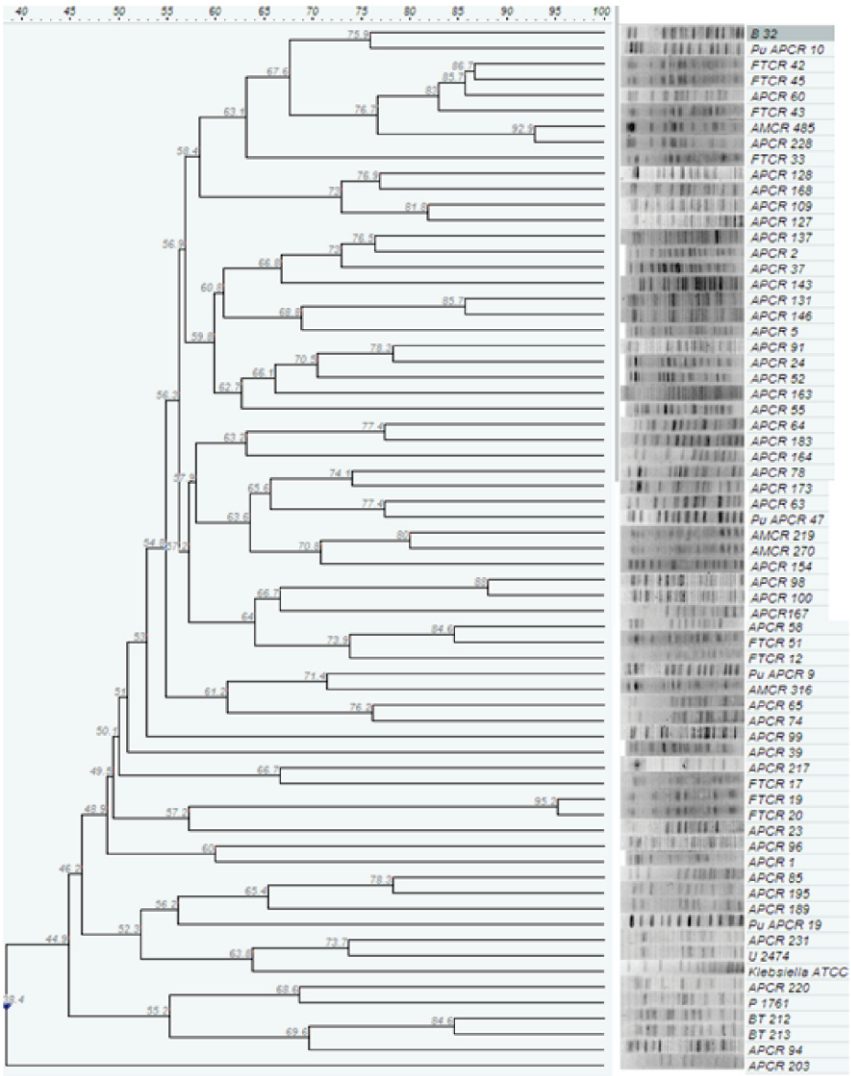

Fig 3. PFGE profiles of Xba-1 digested CR *Klebsiella pneumonia* (n=67) isolated from hospitalized patients in Kolkata during Jan-Dec 2018

Validation of Antimicrobial activity of selected herb against multidrug resistance *Salmonella* Typhi clinical isolates; development of anti-typhodial herbal formulation

Investigators : Dr. Shanta Dutta & Sunayana Soren

The dried plant samples of two different species were powdered using mechanical grinder and then extracted in methanol following maceration technique.The phytochemical screening of the crude methanolic extracts showed that roots extract of *Scopariadulcis* (Extract 1) contained secondary metabolites like Flavonoids, Alkaloid, Terpinoids, Tannins and Phenolics, whereas leaves extract of *Cassia ocidentalis* (Extract 2) contained Flavonoids, Alkaloid, Terpinoids, Tannins and Saponin.

The time-kill assay was performed using bacterial inoculums of one control strain (*S*. Typhi MTCC734) and two clinical strains isolated from typhoid patients (*S*. Typhi K557 and *S*. Typhi K558), which were treated with two different concentrations (7.5 mg/ml and 15 mg/ml respectively) of both the extracts separately and the effects in growth rate were compared with the control set up (bacterial suspension without extract). It was observed that both concentrations of Extract 1were bactericidal to *S*. Typhi MTCC734 and K558 after 24 hours of incubation; only 15 mg/ml concentration of Extract 1was bactericidal to S. Typhi K557 after 24-hour incubation. Both the concentrations of Extract 2 were bacteriostatic to all test strains after 24 hours incubation. The Minimum Bactericidal Concentrations (MBC) of Extract 1 was in the range of >3.7 mg/ml to ≤15 mg/ml and for Extract 2 the MBC was ≤90 mg/ml (but >80 mg/ml) against test strains.

The crude Extract 1 was fractionated into 13 fractions and Extract 2 into 29 fractions by column chromatography. The Minimum Inhibitory Concentration (MIC) and MBC of each fraction were determined. The result showed that few of the fractions had greater antibacterial activity in comparison to others fractions. The Thin Layer Chromatography (TLC) of each fraction showed multiple numbers of bands in all fractions. The identification of compounds presents in crude methanolic extract of Scopariadulcis root and in its fractions with most antimicrobial activity, by HPLC-MS is under process in collaboration with NIPER, Kolkata.

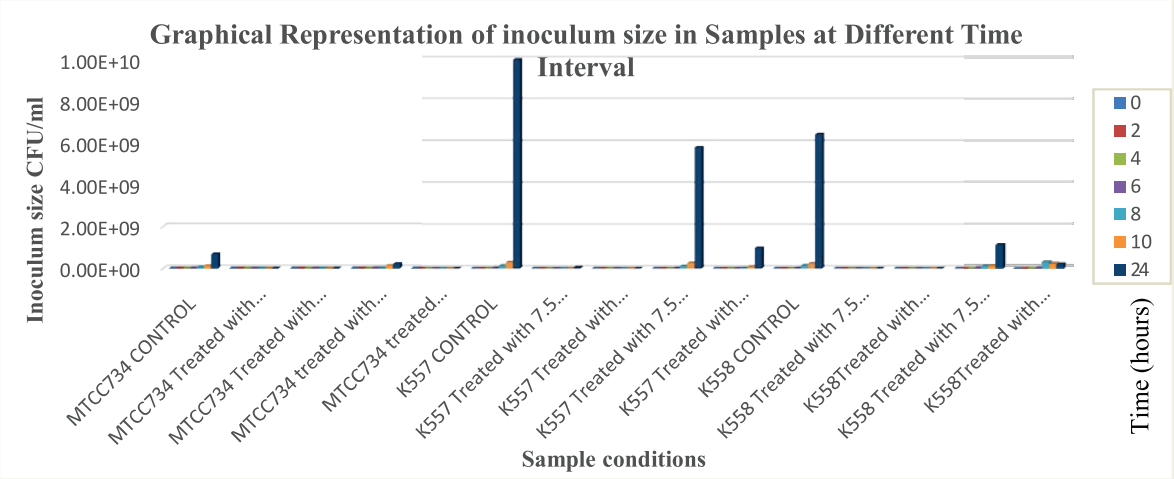

Fig 4: Effects of inoculum size (CFU/ml) in different bacterial cultures with and without plant extract concentration at different time interval.

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended

- 7th Annual Meeting of the Global Task Force on Cholera Control (GTFCC) digitally held on 20-21 October, 2020
- 7th Meeting of the Global Task Force on Cholera Control (GTFCC) Working Group on Oral Cholera Vaccine (OCV) digitally held on 19th November, 2020
- Meeting on establishment of Model Rural Health Research Unit (MRHRU) at at North Bengal Medical College, Sushrutanagar, Darjeeling District on 3rd November, 2020 at Green Room, Swasthya Bhawan under chairmanship of the Secretary, Dept. of Health and Family Welfare, Govt. of West Bengal
- Deeper understanding of COVID-19 phenotypes through metabolomics: A Panel Discussion virtually held on 18th November, 2020

- DST-FICCI Annual Virtual Global R&D Summit 2020 on "Building Resilient Economies through Technology and Innovation: Industry & Science Collaboration in the New World Order" digitally held on November 25-27, 2020
- Indo-German Research Day virtually organized by German Centre for Research and Innovation (DWIH) New Delhi on 3rd December 2020.
- Webinar by BD on "Importance of Antimicrobial Stewardship in COVID-19 Era" held on 19th November, 2020 at 3.00 pm
- First Meeting of the State Task Force for Covid-19 Vaccination for better supervision and monitoring of various preparatory steps as might be required for the introduction of the Covid-19 vaccination in the State on 26th November, 2020 at 11.00 am at School of Tropical Medicine, Kolkata.
- First Meeting of the State Steering Committee for Covid-19 Vaccination for better supervision and monitoring of various preparatory steps as might be required for the introduction of the Covid-19 vaccination in the State on 27th November, 2020 at 2.15 pm at School of Tropical Medicine, Kolkata.
- Brainstorming discussion on the continuation of the DHR schemes for the 15th Finance Commission period (2020-21 to 2025-26) at 10.00 am on 10th December, 2020
- Gut Microbiota and Probiotic Science Foundation Guest Lecture by Dr. V. Mohan, Chairman and Chief - Diabetology, Dr. Mohan's Diabetes Specialities Centre, Chennai on "Diabetes Epidemic in India- Why and What can be Done" on 11th December, 2020 from 6.00 pm – 7.30 pm
- Participated in the high-level panel discussion on: "Vaccine Development, Procurement, Distribution and Deployment: The Role of Data" on 12 January 2021, between 1700 – 1800 hrs organized by Centre for The Digital Future.
- CHOLERA SEARO – Introductory discussions with WCOs on 4th February, 2021 at 3.30pm to 4.30pm
- 3rd training in the Communicating Science Workshop Series on "Synthesizing Science for Parliamentarians" held on 19th February, 2021 between 3-4 pm
- Participated in the panel discussion on "Covid-19 test kits: Future prospects" as Panelist in the Diagnostic Leadership Summit held on 19th February, 2021
- Delivering a talk on "Vaccines against Covid-19" at the virtual webinar by NIPER, Kolkata on 8th March 2021 on the occasion of International Women's Day Celebration
- Invited as a Speaker for the 29th Session of the IBSD International Webinar Series – "Reimagine Ethnopharmacology" held on 20th March, 2021 at 6.00 pm and deliver a talk on "Challenges of Antimicrobial Resistance (AMR): Probable remedial measures by ethnomedicines".

List of patent(s) filed/accepted /Technology developed

Patent title: Development and evaluation of a bivalent invasive non-typhoidal *Salmonella* outer membrane vesicles (BINTSOMVs) based vaccine against non-typhoidal *Salmonella* mediated gastroenteritis.
Year of application: 23rd June, 2020
Patent filed at: Indian Council of Medical Research, New Delhi

Post and Pre-Doctoral fellows:

Post-Doctoral Fellow
Dr. Debmalya Mitra, ICMR-PDF

Pre-Doctoral Fellow
Ms. Priyanka Jain, SRF
Ms. Sriparna Samajpati, SRF-ICMR
Mr. Gourab Halder, SRF-CSIR
Ms. Sunayana Saren, SRF-CSIR
Ms. Sohini Sikder, SRF-CSIR

R. K. Nandy (Principal Investigator), Bacteriology Division

Rapid detection of *Vibrio cholerae* O1 using Loop-mediated isothermal amplification (LAMP) assay.

Culture independent detection of bacterial enteropathogens have been developed earlier using Real-Time PCR based techniques. Despite having lots of benefit of RT-PCR based detection of bacterial enteropathogens, it was difficult to utilize the same in routine diagnostics due its high reagent cost combined with requirement of specialized equipment and highly trained work force. Therefore, development of a cost effective, rapid and species-specific detection of *Vibrio cholerae* O1 using Loop-mediated isothermal amplification (LAMP) assay was attempted. The *wbeM*, one of the genes of O1 antigen coding region was considered as target for developing LAMP assay. Six primers were designed namely forward inner primer (FIP), backward inner primer (BIP), forward outer primer (FOP), backward outer primer (BOP), and the two loop primers forward (LF) and backward (LB). Use of boiled lysates of *V. cholerae* O1 strains as a source of DNA template showed that newly developed LAMP assay detected *V. cholerae* O1 strains with no false positive reactivity in the negative control tubes when tested at 64°C for 20 min (Fig. 5A). Total number of 33 *V. cholerae* O1 strains when tested with newly developed LAMP assay, all came positive with no false negativity. Next, the assay was extended with *V. cholerae* O139 and non-O1, non-O139 strains. Total number of 11 and 22 strains belonging to O139 and non-O1, non-O139 serogroups, respectively, were included. Results showed that all strains belonging to O139 (Fig. 5B) as well as non-O1, non-O139 (Fig. 5C) serogroups remained negative in the newly developed LAMP assay. The assay was further extended with inclusion of other bacterial enteropathogens *Shigella* (n=5), *Salmonella* (n=5), *Aeromonas* (n=5), *V. parahaemolyticus* (n=11) and diarrheagenic *E. coli* (n=5) strains. None other than *V. cholerae* O1 showed LAMP positivity. Therefore, it may be said that newly developed LAMP assay is specific to *V. cholerae* O1.

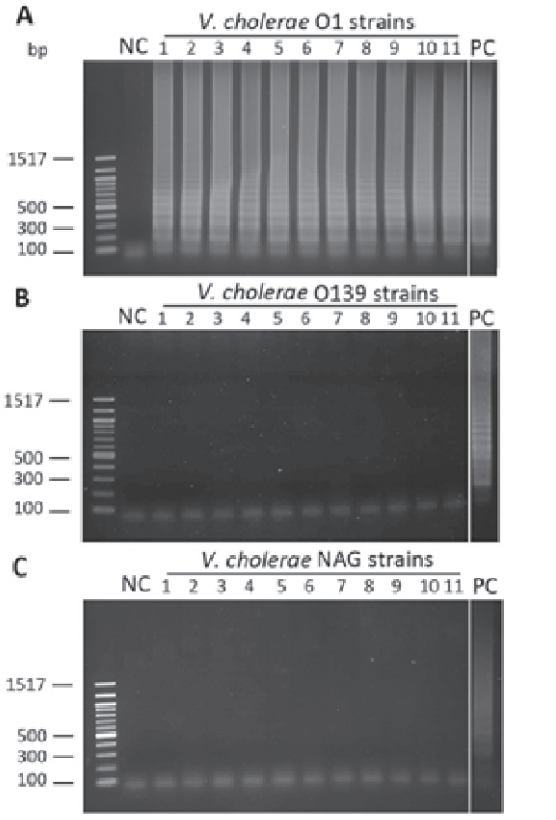

Fig 5: Agarose gel electrophoresis patterns of amplicons obtained in LAMP assay when tested against clinical *V. cholerae* O1 (A), *V. cholerae* O139 (B) and *V. cholerae* non-O1, non-O139 (C) strains. NAG represents *V. cholerae* non-O1, non-O139 strains; negative control (NC) means no DNA template and positive control (PC) means assay with DNA template from *V. cholerae* O1 reference strain N16961. DNA ladder (100 bp) of known molecular weight was included and representative sizes of the bands are indicated.

Serosurvey to identify cholera hotspots.

The burden of cholera in India is not well defined. Literature survey revealed 29,400 cholera cases were reported from different states and Union Territories in India during 2015-2019. Systematic surveillance combine with laboratory diagnosis of cholera is the best way to estimate burden of the disease. Alternatively, serosurvey using immune markers can be utilized to predict cholera cases past one year from date of collection of blood samples. Seroprediction of number of cholera cases across India during 2016-17 has been made using sera samples collected during National dengue serosurveillance during June 2017 to April 2018 from 15 states of India (three each from North, East, North East, South and West). Vibriocidal titers of 7882 sera samples from 9-17 years and 18-45 years age groups were determined against

both serotypes of cholera causing organism *V. cholerae* O1. The overall sero incidence of predicted cholera infection in India was 10.7%. Seroincidence ranges from 12.92 in the Southern to 5.59 in North Eastern region. No overall differences existed in case of predicted cholera infection across age, sex, and area of residence. It was evident that not all districts of a state were equally risk prone as predicted for cholera infection. This observation matched with known pattern of cholera infection, which formed close cluster types. Heat map generated with predicted cholera infection also represented similar pattern. Seroestimation of cholera infection showed matching trend with reported cholera cases in the literature or public domains. Literature survey revealed reported cholera outbreaks from Gujarat, Karnataka, West Bengal, Maharashtra, Odisha, Punjab, and Rajasthan every year during 2015-19. This is in tandem with the seroestimation as observed in this study with high incidence of cholera infection in some of the districts of Karnataka, Maharashtra, West Bengal, Panjab and Rajasthan. Overall, it was evident from this study, footprints of cholera infection was present in all five regions of India with lowest incidence in North Eastern states.

Awards/ Honours received

- Fellow of the West Bengal Academy of Science and Technology (WAST) 2020

List of patent(s) filed/accepted /Technology developed

- Submitted for ICMR patent and processed; ICMR patent application no. 202011054354; December 2020

Post and Pre-Doctoral Fellows*:*

Post-Doctoral Fellow:
Dr. Prosenjit Pyne, DST-SERB

Pre-Doctoral Fellow:
Ms. Taniya Golder, ICMR Fellow

A. K. Mukhopadhyay (Principal Investigator), Bacteriology Division

Role of *ctxB7* allele on higher production of cholera toxin by Haitian variant *Vibrio cholerae* O1: Functional analysis of a single amino acid substitution

Cholera continues to be an important public health concern in developing countries where proper hygiene and sanitation are compromised. This severe diarrheal disease is caused by the Gram-negative pathogen *Vibrio cholerae* belonging to serogroups O1 and O139. These strains secrete cholera toxin (CT) into the extracellular milieu which upon ingestion of contaminated food or water, results in severe loss of water and electrolytes. This CT being the prime virulence factor is directly responsible for the disease manifestation. The *ctxB* gene encodes cholera toxin B subunit (CTB) whereas the A subunit (CTA) is the product of *ctxA* gene. Enzymatic action of CT depends on binding of B pentamers to the lipid-based receptor ganglioside G_{M1}. In the recent past, *V. cholerae* O1 strains with the signature *ctxB7* allele have propagated through many of the cholera endemic regions in Africa and Asia. These strains were also identified as the cause for the devastating cholera epidemic in Haiti that killed around 10,000 victims.These strains produce classical type (WT) CTB except for an additional mutation in the signal sequence region where an asparagine (N) residue replaces a histidine (H) at the 20th amino acid position (H20N) of CTB precursor (pre-CTB). Studies conducted at NICED reported that that Haitian variant *V. cholerae* O1 strains isolated in Kolkata produced higher amount of CT compared to contemporary O1 El Tor variant strains under *in vitro* virulence inducing conditions (Fig 6). It was found that this increased CT production is not related to *ctxB* expression(Fig7).We observed that the *ctxB7* allele, itself plays a pivotal role in higher CT production by using the *V. cholerae* JBK70 (an isogenic Δ*ctxAB* mutant of N16961) harboring the arabinose inducible vector pBAD24 alone, pBAD24 with *ctxB1* or *ctxB7* for elucidating their ability to produce CTB (Fig8).This allowed us to directly compare the secretion of CTB to supernatant in the same underlying genomic context. But the CTB secretion profile is independent of the amount of protein accumulated inside the bacteria (Fig 9).Based on our *in silico* analysis, we hypothesized that higher accumulation of toxin subunits from *ctxB7* allele might be attributed to the structural alteration at the CTB signal peptide region of pre-H20N CTB to contemporary O1 El Tor variant strains under *in vitro* virulence inducing conditions (Fig10).Overall, this study provides plausible explanation regarding the hypertoxigenic phenotype of the Haitian variant strains which have spread globally, possibly through positive selection for increased pathogenic traits.

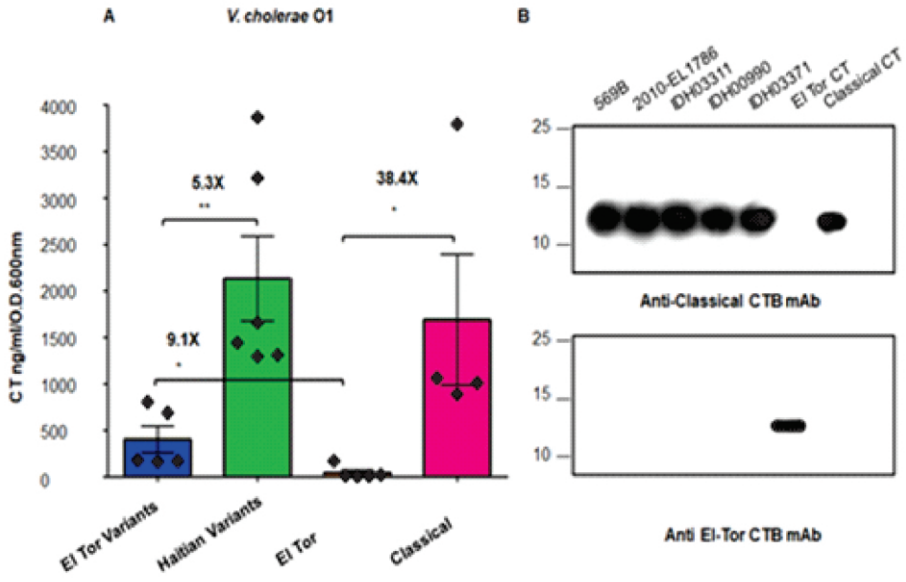

Fig6 : Study of toxin secretion in *V. cholerae*. (A) Quantification of total cholera toxin (CT) production by *V. cholerae* O1 strains isolated from Kolkata under AKI conditions. CT (ng/ml/OD600) produced by *V. cholerae* O1 Haitian variants L19494 (2006), IDH00990 (2008), IDH03311 (2010), IDH03454 (2011), IDH03595 (2011), and the Haitian outbreak isolate 2010EL-1786 was measured and compared with that secreted by El Tor variant strains K3314 (2005), L4867 (2006), IDH00161 (2007), IDH00790 (2008), and IDH03371 (2010), El Tor strains V24, V7, V32, V54 and V100, and classical strains L362, GP15, GP145, GP147, [20]. In vitro CT production was determined by GM1 CT ELISA as described in materials and methods. Every black diamond represents a single strain. The mean value of at least three individual experiments for each strain is shown with error bars signifying standard errors for each group. An unpaired two-tailed student's t test was used to analyse the statistical significance of the data. (* P value <0.05, **P value <0.005). "X" indicates the fold difference in values. *V. cholerae* Haitian variants isolated from Kolkata produced higher amount CT under AKI conditions (B) Western immunoblot results of the culture supernatants of representative *V. cholerae* O1 strains. 20 ng of the purified classical CT was used as positive control for immunoblotting with the monoclonal antibody against classical CTB. All of the tested variants produced classical CT (Epitype 1)

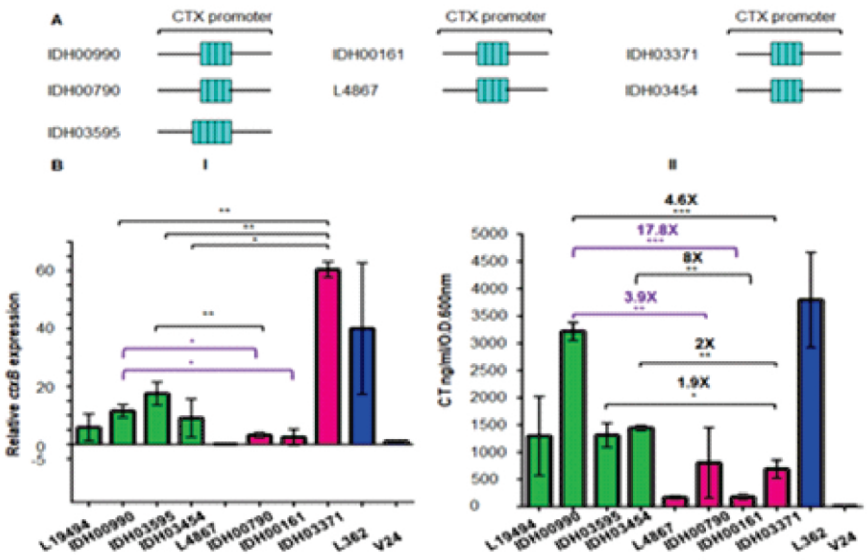

Fig7 : Analysis of the role of transcriptional regulation in CT overproduction among Haitian variants. (A) Schematic representations of the CTX promoter region in *V. choleae* isolates. Turquoise rectangles each represent a single 5′-TTTTGAT-3′ heptad repeat. (**B**) qRT PCR (I) and measurement of CT production (II). *ctxB* expression was normalized to the *recA* gene with the expression of the *ctxB* in V24 set to 1.0. Results are from two independent experiments performed in triplicate. Purple brackets identify two separate cases where transcriptional upregulation of the *ctxB* gene might have resulted in the higher production of CTunder *in vitro* condition. Error bars represent standard deviations from at least two biological replicates. Statistical significance is indicated at *P* values (* P value <0.05, **P value <0.005, ***P value <0.0005). No connection was found between *ctxB* transcriptional regulation and the overproduction of CT in the Haitian variants. The number of TTTTGAT heptad repeats did not correlate with the *ctxB* mRNA level or the amount of toxin produced *in vitro.*

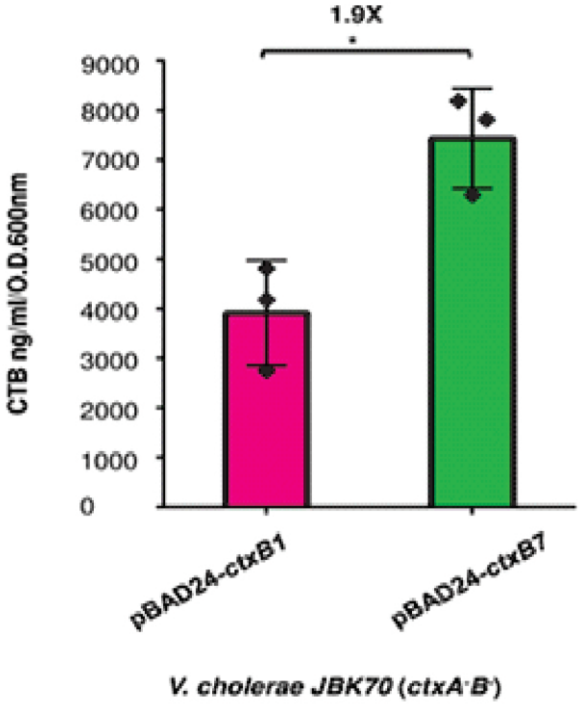

Fig8 : Measurement of toxin subunit secretion by recombinant *V. cholerae* cells. CT ELISA with culture supernatants of recombinant JBK70 strains expressing either *ctxB1* or *ctxB7* from pBAD24 (See Table 1). CT production was determined by GM_1 CT ELISA in triplicate. Mean value of at least three individual experiments (represented by black diamonds) is presented. Standard deviations are indicated with error bars. Unpaired two-tailed student's t test was used to analyse the statistical significance of the data. (*P value <0.05). The fold difference in CT values ($ng/ml/OD_{600nm}$) is presented by "X". Result showed that *ctxB7* contributes to higher amount toxin production *V. cholerae.*

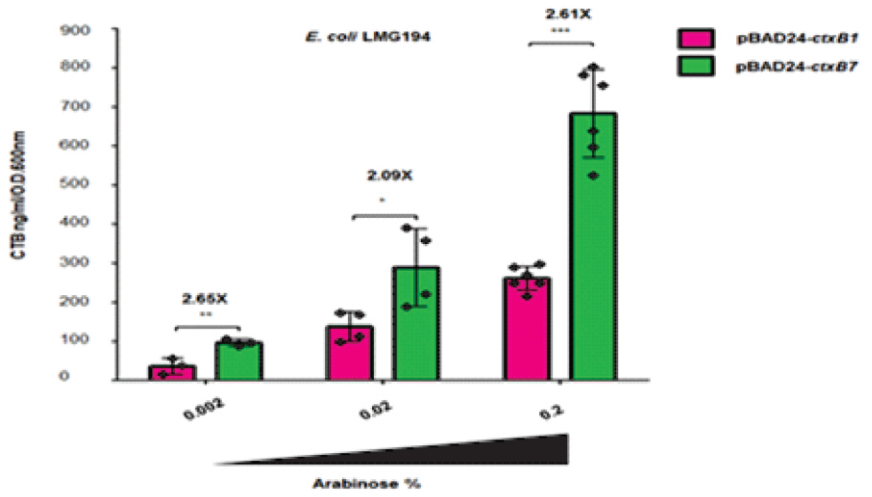

Fig9 : CTB Secretion profile of *E coli* strains AN5 (LMG194/pBAD24-*ctxB1*) and AN6 (LMG194/pBAD24-*ctxB7*). Expression of *ctxB* gene was induced from pBAD promoter by the adding 0.002, 0.02 or 0.2 % of arabinose in the media and secretion of CTB was measured from cell free culture supernatants of the bacterial strains. Individual experimental data has been represented by black diamonds. For each set of samples, mean values were plotted. Error bars indicate standard deviations of at least three individual experiments. Statistical significance of the data was calculated using Two-way ANOVA. (* *P* value <0.05, ** *P* value <0.005, *** *P* value <0.0005). See text for further details. Results depicted that secretion profile is independent of the amount of toxin subunits accumulated inside the bacteria and the fold difference remained unchanged even under different concentrations of the added inducer.

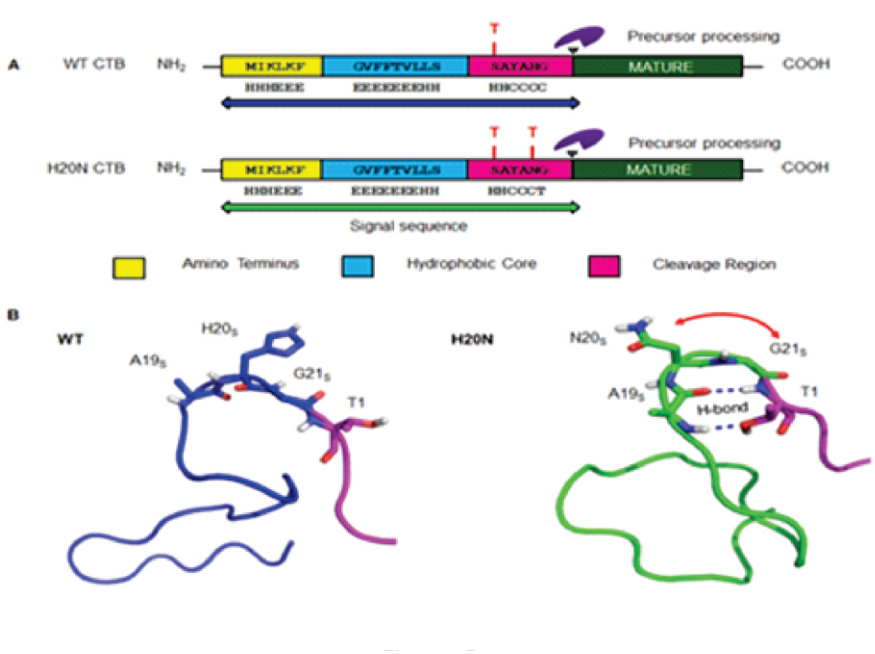

Fig10 : Distinct properties of the H20N CTB signal peptide. (A) Schematic representation of the signal sequence of *V. cholerae* cholera toxin subunit B protein from O395 and 2010 El-1786. Three different regions in the signal peptide have been shown in three different colors. The N terminal region which bears a net positive charge of +2, has been highlighted in yellow. The hydrophobic core and cleavage regions are shown in cyan and magenta respectively.Mature portions of the CTB monomers are shown in yellow. The black arrow indicates signal sequence processing site. Histidine and asparagine residues at the -2 site have been underlined. Secondary structure prediction of the WT and H20N CTB signal sequences using Chou and Fasman Secondary Structure Prediction Server (CFSSP) shows diversity in the secondary structures of both WT and H20N CTB signal peptides. Helix (H), Sheets (E), Coils (C) and Turns (T) of both the WT and H20N signal sequences have been indicated over the specific amino acid residues. Position of β turns have been indicated over the specific residues. (**B**) Minimum energy conformation of the WT and H20N CTB resulted from the 10 nano seconds molecular dynamics simulation, showing the conformational change of the H20N CTB signal sequence with respect to WT signal sequence by an introduction of β-turn (indicated by the red curved arrow) between residues A19, N20, G21 and T1. Our *in silico* analysis illustrated that H20N substitution results formation of an additional β-turn around the cleavage region and reduction on β-turn probabilities lowers the efficiency of protein translocation

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OXA-181-like carbapenemases in *Klebsiella pneumoniae* from septicemic neonates: co-existence with NDM-5, transmissibility, and genome diversity

Three major carbapenemases *viz.* New Delhi Metallo-β-lactamase, *Klebsiella pneumoniae* carbapenemase-2 and Oxacillinase-181-like (OXA-181-like) have been identified from neonatal specimens. A study was carried out on Oxacillinase-181-like carbapenemases to evaluate the linkage with various mobile genetic elements and determine its association with sequence types. *Klebsiella pneumonia* possessing these carbapenemases ($bla_{OXA-181}$, n=7; and $bla_{OXA-232}$, n=4) belonged to diverse sequence types (ST14, ST15, ST23, ST48, and ST231). $bla_{OXA-181/OXA-232}$ & bla_{NDM-5} was found in a high-risk clone ST14 (n=4). Conjugal transfer of $bla_{OXA-181/232}$ was possible in presence of bla_{NDM-5} only. Whole genome sequencing (WGS) was carried out for strains and data was further analyzed and a collection of different resistance genes conferring resistance to many antibiotics and also to heavy metals was detected. All strains harbored various plasmid scaffolds such as IncFIIK, IncFII, IncR, IncFIA, IncFIB(K), IncFIB (pQil), ColKP3, Col4401I, Col4401II, ColKP3, IncA/C2, IncX3, and IncHI1B. Association of $bla_{OXA-181/232}$ was found with a non-conjugative ColKP3 plasmid (~6-8Kb) on a truncated Tn*2013*, while bla_{NDM-5} was found in a conjugative IncFII plasmid of size ~200Kb on truncated Tn*125*. $bla_{OXA-181/232}$ possesses mobilization relaxosome (*mobB*, *mobC*, and *mobD*) along with truncated/ deleted IS*Ecp1* in upstream and transcription regulator, *LysR* (truncated) in the downstream (Fig 11). A core genome phylogenetic analysis was carried out with 191 *K. pneumoniae* genomes reported in NCBI and 6 study strains possessing OXA-48-like & NDM-like genes, and neonatal strains with published genomic data (Fig 12). Study strains were found to be diverse among themselves and were found to be related to non-neonatal strains from Spain, China, Norway, United States of America, United Kingdom, Pakistan, Thailand; and with neonatal strains from Ghana and Tanzania. We found $bla_{OXA-181/OXA-232}$-harbouring isolates from a single neonatal unit had remarkably diverse genomes ruling out clonal spread and emphasizing the extent of plasmid spreading across different STs. This study is probably the first to report coexistence of $bla_{OXA-181/232}$ and bla_{NDM-5} in neonatal isolates.

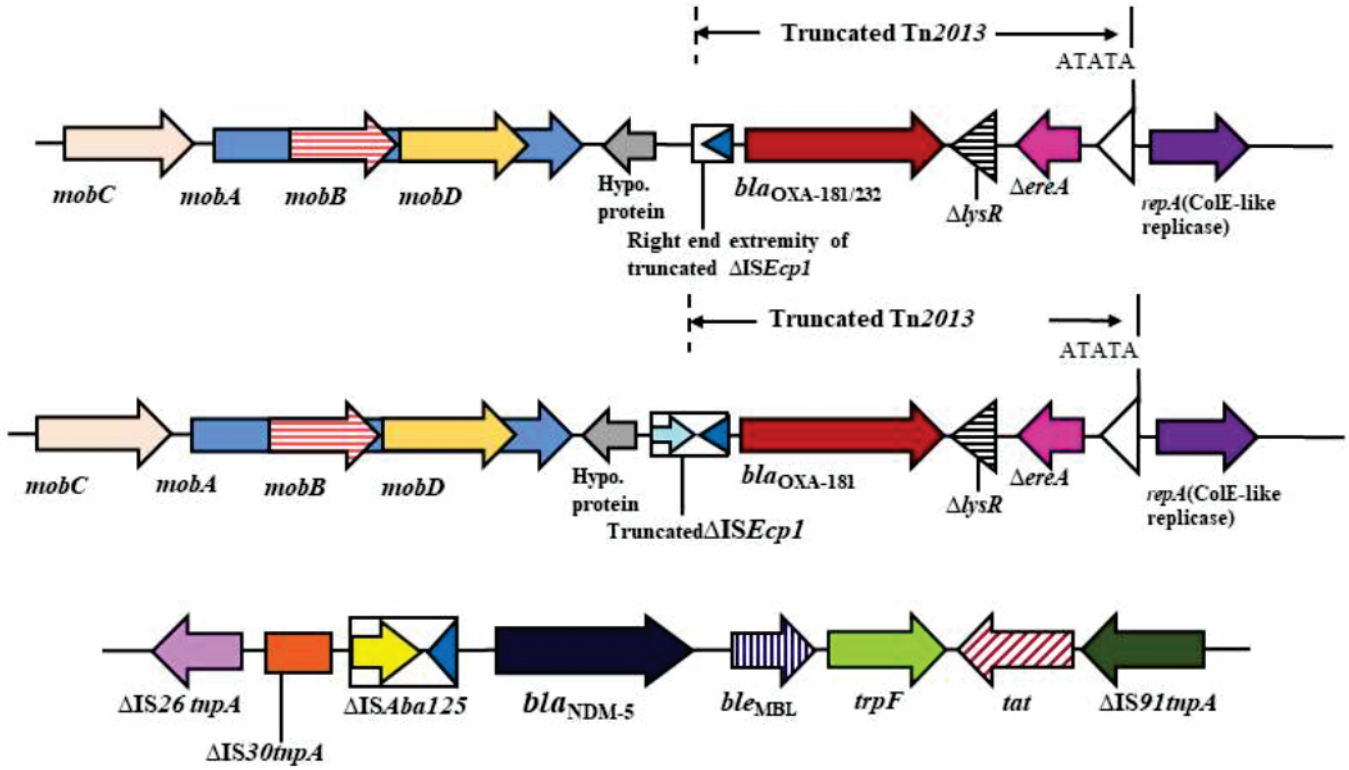

Fig 11: Genetic environment of $bla_{OXA-181/232}$ and bla_{NDM-5} in the *K. pneumonia* strains isolated from neonates

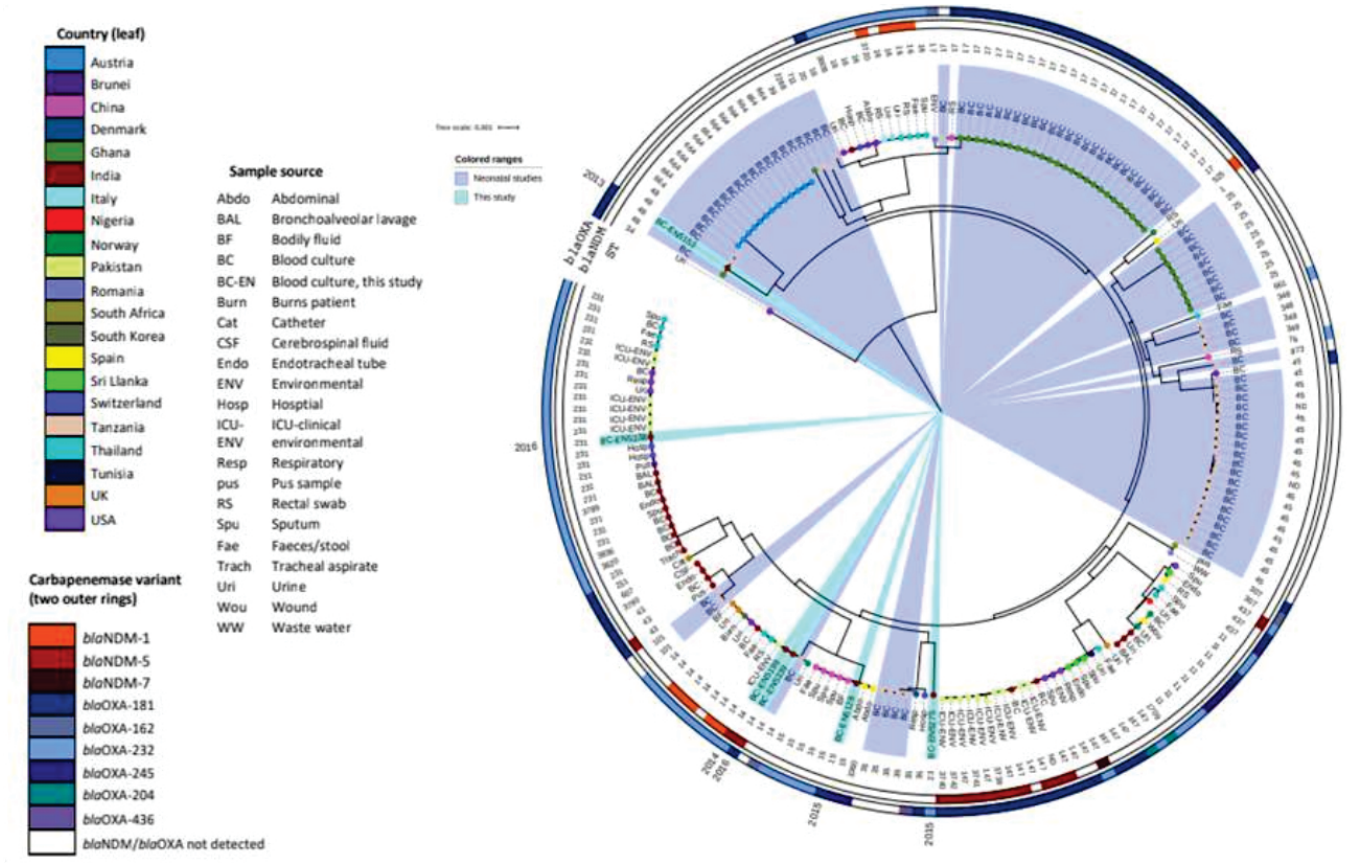

Fig 12: Core genome phylogeny of 197 *Klebsiella pneumoniae* isolates using Roary (v3.12.0) and FastTree (v2.1.11). Clades containing isolates from this study are highlighted in teal, and light blue clade highlights indicate *K. pneumoniae* neonatal sepsis isolates from other studies

Fluoroquinolone resistance in neonatal septicaemic *Acinetobacter baumannii*: A 7-year single centre study

In the era of antimicrobial resistance, appropriate use of fluoroquinolones can be a choice in treatment of infections caused by *Acinetobacter baumannii*. A study of fluoroquinolone ressitance in neonatal specimens collected over a period of 7 years was carried out. *A. baumannii* were highly diverse, as 24 sequence-types with seven novel STs (ST-1440/ST-1441/ST-1481/ST-1482/ST1483/ST-1484/ST-1486) was noted (Fig 13). High resistance to third and fourth generation fluoroquinolone, such as ciprofloxacin, levofloxacin and particularly moxifloxacin among the septicaemic isolates was observed. Resistance to even 4th generation fluoroquinolone (moxifloxacin) in neonatal isolates is worrisome especially in a developing country where rate of infection is high. The predominant mechanism found to be associated with fluoroquinolone resistance was chromosomal mutations i.e. mutations within *gyrA* (S83L) and *parC* (S80L) genes. Efflux-based fluoroquinolone resistance was also detected among 65% of the isolates with ≥ 2 different active pumps in some strains. Overexpression of adeb (was highest followed by adeJ, adeG, and abeM. Amino acid changes in the regulators (AdeRS/AdeN/AdeL) either as single or multiple substitutions substantiated the overexpression of the pumps. Chromosomal mutations and active efflux pumps were detected simultaneously among 64% of resistant strains. Chromosomal mutations were considered to be the predominant mechanism of fluroquinolne resistance. However, isolates where pumps were also active had higher MIC values, establishing the critical role of the efflux pumps. This reveals the complexity of interpreting the interplay of multiple resistance mechanisms in *A. baumannii*.

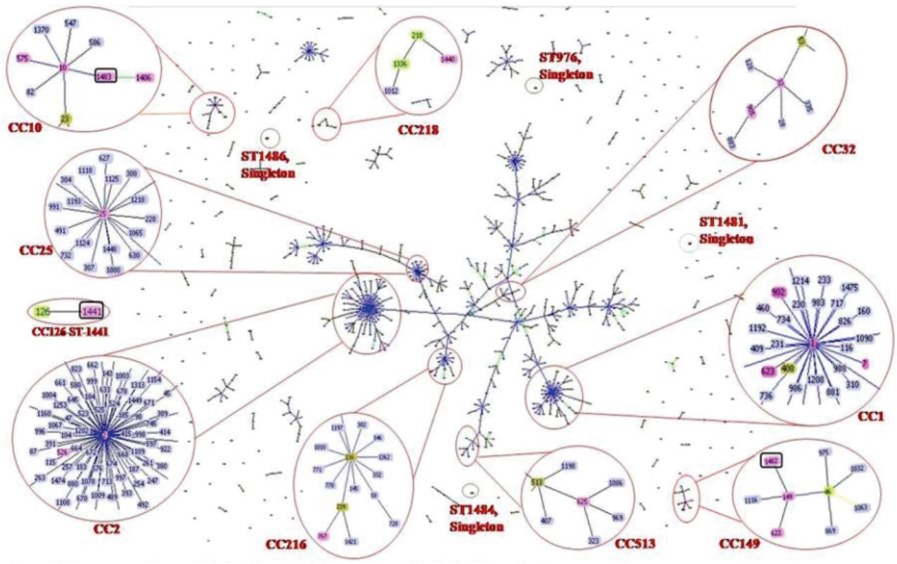

Fig 13: Sequence types (STs) of neonatal septicaemic *Acinetobacter baumannii*

All STs of 47 *A. baumannii* had shown in the context of all of the 1507 STs (as per Pasteur analysis) present in the Global MLST database (http://www.pasteur.fr/mlst; as of July 2020). The scheme was constructed using Global optimal eBURST (goeBURST) analysis. The Clonal Complexes (CCs) and STs observed in the present study were enlarged and circled with red colour. STs from MLST database were highlighted with light blue colour, the STs identified in the study were highlighted with pink colour, founder STs in each CC was highlighted with light green colour although few STs (ST-1, ST-2, ST-10, ST-25, ST-32, ST-149) which were identified in this study and also the founder STs, were highlighted with pink. Six novel STs were identified in the study among which three were related to known CCs, highlighted with pink colour and circled with black colour. The rest novel STs found as singletons was indicated as red dot, circled by black colour.

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Oxacillinase-48-like (OXA-48) carbapenemases along with New Delhi metallo-β-lactamase in a neonatal unit. 30th European Congress of Clinical Microbiology and Infectious Diseases, Paris, France, online-mode, 18th -21st April, 2020.Naha, S., Mukherjee, S., Sands, K., Chattopadhyay, P., Mukherjee, S., and **Basu, S**. – Selected for poster but couldn't be presented due COVID-19 pandemic.
- Carbapenem-resistant *Escherichia coli* causing neonatal sepsis: NDM-5 gains prominence. 30th European Congress of Clinical Microbiology and Infectious Diseases, Paris, France, online-mode, 18th -21st April, 2020. Bhattacharya, A., Mitra, S., Naha, S., Saha, B., Dutta, S., and **Basu, S.** - Selected for poster but couldn't be presented due COVID-19 pandemic.

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Mr. Ankur Rao- JRF

H. Koley (Principal Investigator), Bacteriology Division

Bivalent non-typhoidal *Salmonella* outer membrane vesicles immunized mice sera confer passive protection against gastroenteritis in a suckling mice model.

Invasive Non-Typhoidal *Salmonella* (iNTS) serovars; specially *Salmonella* Typhimurium (ST) and *Salmonella* Enteritidis (SE), causes gastroenteritis worldwide. Due to emergence of multi-drug resistance in iNTS, a broad-spectrum vaccine is urgently needed for prevention of iNTS infection. Currently there is no effective licensed vaccine against iNTS available in the market. We have formulated an outer membrane vesicles (OMVs) based bivalent immunogen as a vaccine candidate to generate a broad-spectrum protective immunity against both recently circulating prevalent ST and SE. We have isolated OMVs from ST and SE and formulated the immunogen by mixing both OMVs (1:1 ratio). Three doses of bivalent immunogen significantly induced humoral immune response against lipopolysaccharides (LPS) and outer membrane proteins (OMPs) as well as cell mediated immune response in adult mice. We also observed that proteins of OMVs acts as an adjuvant for generation high level of anti-LPS antibodies through T cell activation. Then, we have characterized the one-day old suckling model for both ST and SE mediated gastroenteritis and then used the model for passive protection study. In the passive protection study, we found passive transfer of bivalent OMVs immunized sera significantly reduced ST and SE mediated colonization and gastroenteritis symptoms in colon of suckling mice than non-immunized sera recipients. Overall study demonstrated that OMVs based bivalent vaccine can generate broad spectrum immunity against prevalent iNTS mediated gastroenteritis and also established the suckling mice model as a suitable animal model for vaccine study against iNTS mediated gastroenteritis.

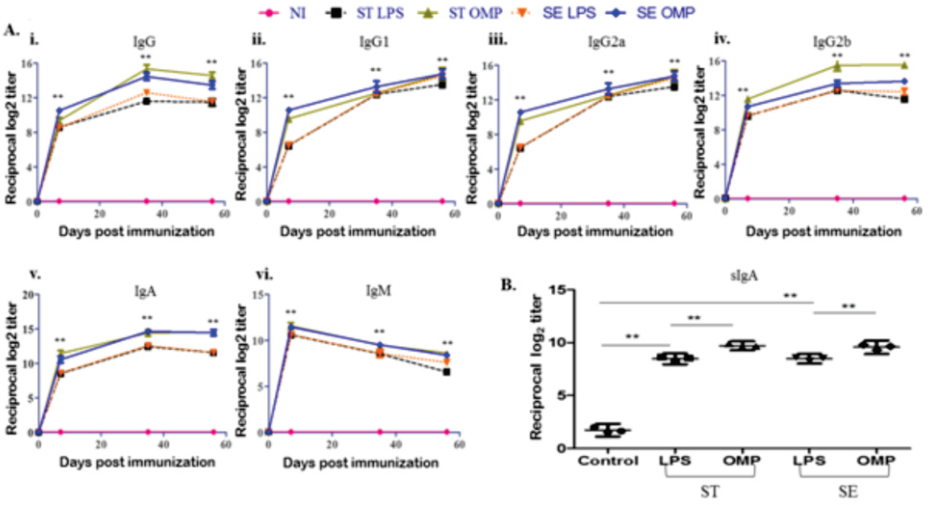

Fig 14: Reciprocal log2 titers of serum immunoglobulins and mucosal IgA in bivalent iNTS OMVs immunized and non-immunized groups were separately measured against each serotype specific component of OMVs after three doses of i.p immunization with bivalent iNTS OMVs. **A)** Serum IgG (i), IgG1 (ii), IgG2a (iii), IgG2b (iv), IgA (v), IgM (vi) (** $p<0.01$). **B)** Reciprocal log2 titer of sIgA from intestinal lavage against LPS and OMPs of *S.* Typhimurium and *S.* Enteritidis on 35th day post immunization. (* $p < 0.05$, ** $p < 0.01$). ST, *S.* Typhimurium; SE, *S.* Enteritidis.

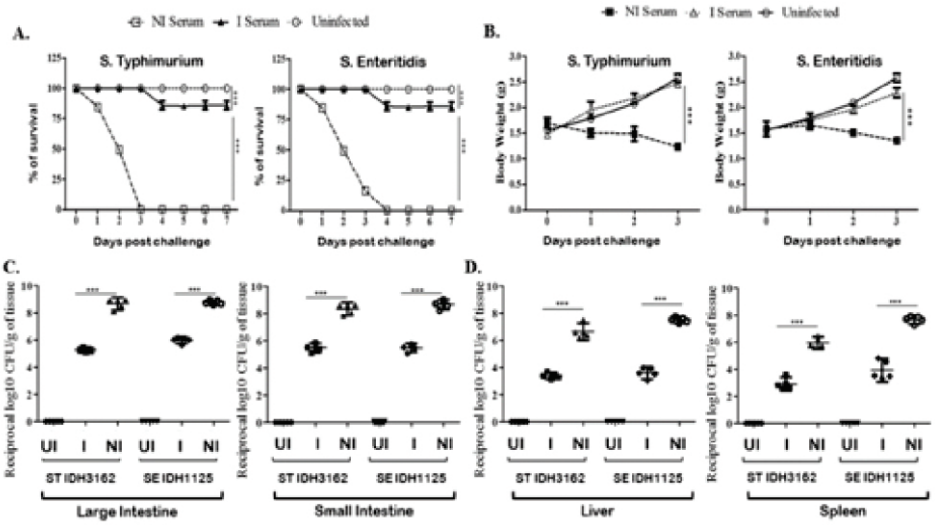

Fig15: One day old sucklings were challenged with heterologous ST IDH3162 and SE IDH1125 (CFU 1×10^7). **A)** Percent survival against *S*. Typhimurium and *S*. Enteritidis lethal challenge dose. **B)** Suckling were challenged with sub-lethal dose of IDH3162 or IDH1125 (CFU 1×10^5). Body weight graph shows sucklings that received non-immunized serum decreased drastically (*** $p<0.001$). Comparative protective efficacy of immunized and non-immunized serum receiving sucklings (n=5), after challenge with sub-lethal wild type ST or SE. A lower level of colonization at **C)** colon, small intestines and **D)** liver, spleen were seen in suckling that received bivalent iNTS OMVs immunized adult mice serum than non-immunized serum receiving group (*** $p<0.001$). UI, Uninfected; I, Immunized; NI, non-immunized.

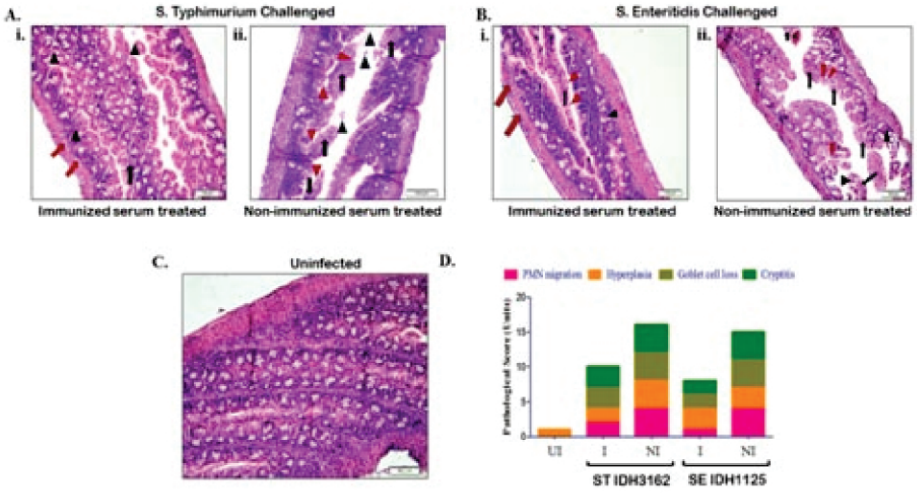

Fig 16: Bivalent iNTS OMVs immunized serum reduces tissue injury and acute gastroenteritis mediated inflammation in suckling colon post challenge with ST and SE (1×105CFU). A) Suckling mice challenged with ST (i) immunized serum treated, (ii) non-immunized serum treated. B) Suckling mice challenged with SE (i) immunized serum treated, (ii) non-immunized serum treated. Intestines of suckling treated with BINTSOMVs immunized mice serum showed mild hyperplasia, PMN migration in submucosa and within tissue, whereas non-immunized serum treated suckling intestine showed marked level of hyperplasia, crypt loss and goblet cell loss. (Black arrowhead- Crypt alteration with mucus or inflammatory cell; Red arrowhead- Goblet cell loss; Black arrow- PMN migration marked level; Red arrow- PMN migration mild level. All images were taken with 200×, scale bar 100 µm.) C) Uninfected mice colon sections showed mild or no level of inflammation. D) Pathological score post challenge showed less inflammation in suckling treated with iNTS OMVs immunized adult mice serum than non-immunized adult mice serum treated group. UI, Uninfected; I, Immunized; NI, non-immunized.

PhD Awarded:

Dr. Debaki Ranjan Howlader received PhD from Jadavpur University
Title of the Thesis: Studies on immunogenic, protective efficacy and immunomodulatory role of Outer Membrane Vesicles (OMVs) from typhoidal salmonellae.
*Date of Degree:*2020

Dr. Sounak Sarkar received PhD from the Calcutta University
Title of the Thesis: Study on dynamic changing of phenotypic characters of *Vibrio cholerae* due to genetic alteration in last decades
*Date of Degree:*2020

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Mr. Sanjib Das, JRF-UGC

N. S. Chatterjee (Principal Investigator), Biochemistry Division

Molecular characterization of Enterotoxigenic *Escherichia coli* colonization factors

EatA, a secreted serine protease, is the predominant non-classical virulence factor of enterotoxigenic *Escherichia coli* circulating in this region. EatA We tested the expression of EatA under different factors like bile, mucin, salt etc. Distinct effect on EatA expression was noted in presence of iron (II) salt. Maximal expression of EatA was seen 0.2 mM iron (II) salt at pH 6 and at 37˚C. In a rabbit model, the expression of EatA was most at $1x10^8$ cfu/ml. Understanding the expression of EatA during pathogenesis of ETEC will generate information that can be exploited towards developing methods of controlling infection and a strategy for vaccine development.

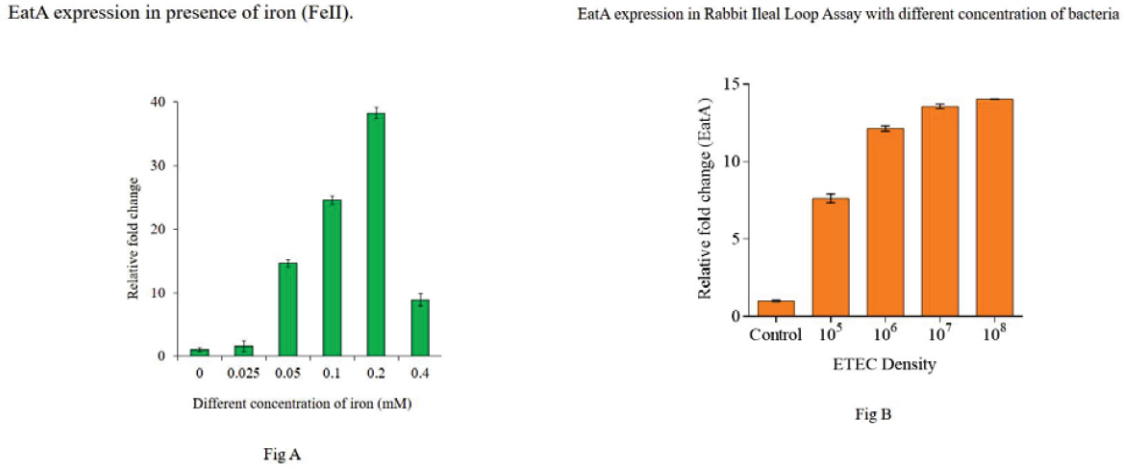

Fig 17: Distinct effect on EatA expression in presence of iron (II) salt. Maximal expression of EatA seen 0.2 mM iron (II) salt at pH 6 and at 37˚C. In a rabbit model, the expression of EatA was most at $1x10^8$ cfu/ml.

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Therapeutic intervention of *Shigella flexneri* host pathogen interaction by a herbal compound

Shigella flexneri a Gram-negative bacterium causing bacillary dysentery modulates different signalling pathways to survive within the host niche. One of the major host defence signalling machineries is autophagy. *S flexneri* releases virulence factors to avoid autophagic degradation. In this project, the mechanism of autophagy has been exploited by Capsaicin (Caps), a herbal compound to intervene *S flexneri* proliferation. Capsaicin induces promoter activity of autophagy genes (Fig.18).It has been showed that autophagic gene activation by Caps is mediated via a transcription factor TFEB. Caps augmented nuclear localisation of TFEB which in turn binds to promoter element of autophagic genes and induced gene expression. Overexpression and silencing of TFEB effected *S flexneri* growth (Fig.19&20). Overall, this work demonstrates that Caps induces nuclear localization of TFEB and binds to promoter of autophagy genes, to inhibit *S flexneri* intracellular infection. Hence, exploiting host autophagy machinery by Caps appears to be a promising therapeutic strategy in combating *S flexneri* infection

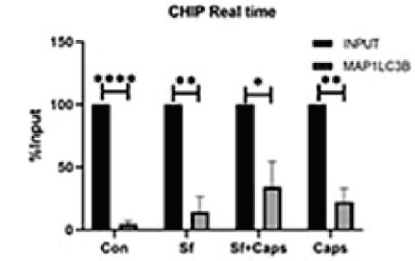


Fig 18:Capsaicin (Caps) induced TFEB binding to promoter of autophagy genes (MAP1LC3B) in *S flexneri* infected and uninfected cells.

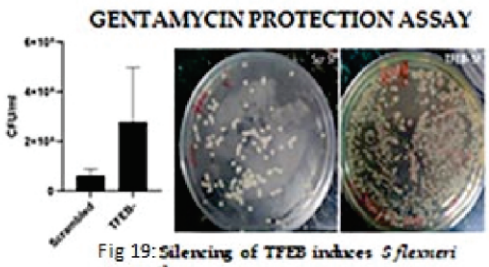
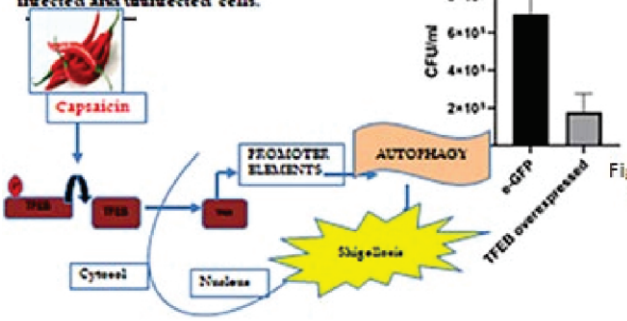


Fig 19: Silencing of TFEB induces *S flexneri* growth



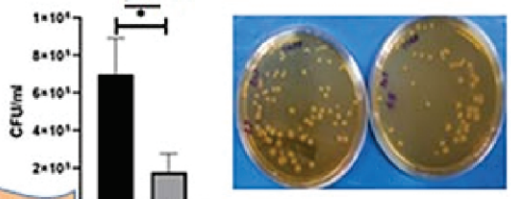


Fig 20: Overexpression of TFEB inhibits *S flexneri* growth

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Participated in a workshop conducted by **ICMR, FICCI entitled "ICMR FICCI Health technology Accelerated Commercialisation Program H:TAC"July 11-August 8, 2020 (Online)**
- Participated in a training program online conducted by AMITY group of Universities. entitled "**Capacity Building Program for Technical Personnel" 22nd February-5th March 2021**

Post and Pre-Doctoral Fellow:

Pre-Doctoral Fellow:
Ms. Priyanka Basak, SRF-DBT
Ms. Uzma Khan, SRF-CSIR
Ms. Priyanka Moitra,JRF-CSIR
Ms. Sushmita Kundu, JRF-UGC

S. Basak (Principal Investigator), Bioinformatics Division

Analysis of genetic diversity and evolution of Dengue virus using completely sequenced genomes.

We retrieved the protein-protein interaction network data for the "only human" and protein-protein interaction network data for "dengue-human" from freely available databases. We calculated the values of global network centrality parameters for all the human proteins present in dengue-human protein-protein interaction network for a given serotype. Then we calculated the values of global network centrality parameters for the same set of human proteins in the only human protein-protein interaction network. If a node shows less importance in only human interaction network but strong importance in dengue-human protein-protein interaction network, then we can consider that node for a possible drug target. Since regulating/blocking that node may influence negligible amount in human systems but it will harmful for the viral life cycle and thus by targeting that node may reduce/block viral replication and may reduce the viral load. By comparing two sets of global network centrality parameters we retrieved those proteins having higher global centrality values in dengue-human protein-protein interaction network but lower global centrality values in only human protein-protein interaction network. This subset of proteins has more important role in dengue-human protein-protein interaction network compared to only human protein-protein interaction network. The same procedure was repeated for other three dengue serotypes. We compared the four subsets of human proteins obtained for four dengue serotypes. The common set of human proteins as potential drug target was prepared out of the four subsets.

Underlying selection for the diversity of Spike protein sequences of SARS-CoV-2

The global spread of SARS-CoV-2 is fast moving and has caused a worldwide public health crisis. In the present manuscript we analyzed spike protein sequences of SARS-CoV-2 genomes to assess the impact of mutational diversity. We observed from amino acid usage patterns that spike proteins are associated with a diversity of mutational changes and most important underlying cause of variation of amino acid usage is the changes in hydrophobicity of spike proteins. The changing patterns of hydrophobicity of spike proteins over time and its influence on the receptor binding affinity provides crucial information on the SARS-CoV-2 interaction with human receptor. Our results also show that spike proteins have evolved to prefer more hydrophobic residues over time. The present study provides a comprehensive analysis of molecular sequence data to consider that mutational variants might play a crucial role in modulating the virulence and spread of the virus and has implications for therapeutic strategies.

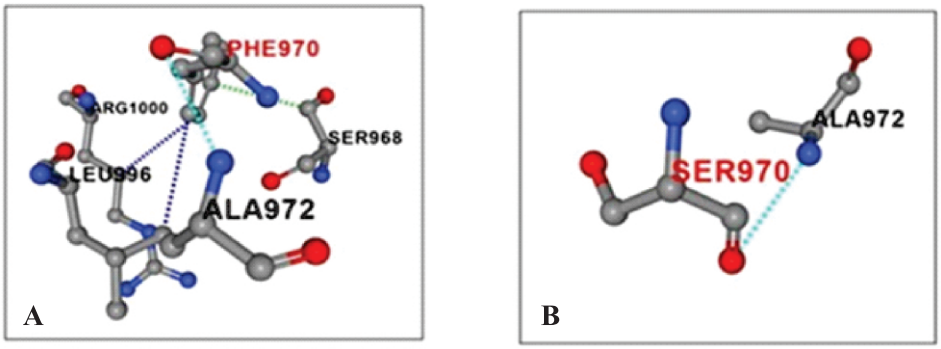


Fig 21 : Comparison of interaction profile of an identified mutation F970S in Spike-protein indication hydrophobic (A) to hydrophilic (B) amino acid substitution.

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Delivered invited lecture virtually in the international workshop on Fundamentals of Bioinformatics organized by Department of Life Sciences, Rama Devi Women's University, Bhubaneswar, Odisha on 30th January, 2021.
- Delivered invited lecture virtually on 26th September, 2020 in the international symposium on 'Biological Sciences: Impacts on Modern Civilization, Current and Future Challenges' on the title, "Genomic data analysis: challenges and achievements". This symposium was organized by Rabindranath Thakur Mahavidyalaya, Tripura

Pre-Doctoral Fellow:
Ms. Manisha Ghosh, SRF-ICMR

M. Dutta (Principal Investigator), Electron Microscopy

High resolution structural studies of newly isolated Shigellaphages bycryo-electron microscopy and image processing.

Physicochemical characterization of Shigella phage Sfk20 has been carried out successfully including host range, one-step growth curve, temperature, UV, and pH stabilities. The phage morphology and head and tail lengths were also determined (Myoviridae family phage). Phage attachment to host bacteria was observed by transmission and scanning electron microscopy. The effect of the lytic phage on biofilm disruption was studied by visualization of biofilm formation and its disruption (Fig.22) under a scanning electron microscope (SEM). The phage genome was isolated using a DNA extraction kit and genome library prepared successfully. Phage genome has been sequenced and deposited in GenBank under the name Sfk20 and the sequence was published with accession number: MW341595 successfully. Genome analysis showed that the phage Sfk20 genome consists of 164878 bp with a 35.62% total G+C content and 241 ORFs. Fig.23 represents the schematic genome map of phage Sfk20 drawn using the CGView Server.

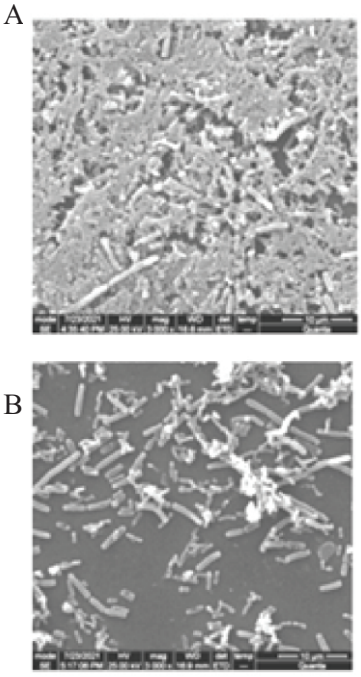


Fig.22: Scanning electron micrographs of *Shigella flexneri* biofilm A) at 48 hrs, B) Disruption of biofilm after treatment with phage Sfk20

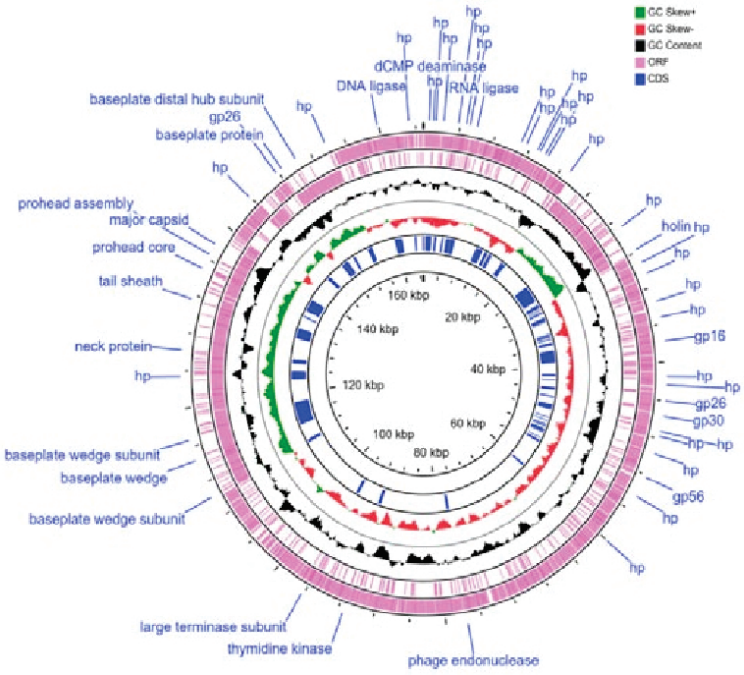


Fig.23: Schematic genome map of phage Sfk20 using the CGView Server

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

Title : Colloquium Lecture Series (Virtual)
Date : 17th October, 2020.
Place : Online
Organizer : School of Biotechnology, Presidency University
Status of participation : Invited Speaker
Presentation Title : "In situ structural analysis of enveloped virus membrane proteins by cryo-electron tomography"

Pre-Doctoral Fellow:
Ms Bani Mallick, SRF-UGC
Ms Payel Mondal, JRF-CSIR

A. Deb (Principal Investigator), Epidemiology and Data Management Division

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Conducted online training on Climate Change and Waterborne Diseases for State Nodal Officers (SNOs) and District Nodal Officers (DNOs) for Kerala, Mizoram, Rajasthan & Haryana organized by NCDC, New Delhi on Oct 20, 2020.
- Conducted online training on Climate Change and Waterborne Diseases for State Nodal Officers (SNOs) and District Nodal Officers (DNOs) for Bihar, Jharkhand and Chhattisgarh organized by NCDC, New Delhi on Nov 05, 2020.
- Participated in the National Review Meeting of National Programme on Climate Change and Human Health organized by NCDC, New Delhi on Feb 09, 2021.
- Attended the CSE Webinar on Sustainable Urban Water Management: Challenges and Opportunities for Mainstreaming Climate Adaptation organized by Centre for Sustainable Environment on Mar 05, 2021.
- Participated in Hindi Translation workshop on Mar 12, 2021 at ICMR-NICED.
- Participated in Online ICMR Training on Roles & Responsibilities of Ethics Committee Members held on Mar 16, 2021organized byICMR Bioethics Unit, ICMR-NCDIR, Bengaluru.
- Received online GCP training on Mar 27, 2021.
- Participated in "Publishing Webinar- Tips from the Editors" jointly organized by ICMR and Elsevier on Mar 30, 2021.

S. Kanungo, (Co-Principal Investigator), Division of Epidemiology and Data Management

National Surveillance System for Enteric Fever in India

Principal Investigator : Dr. Shanta Dutta, Director and Scientist G
Co- Principal Investigator : Dr. Suman Kanungo, Scientist E

A multi-centric community based prospective enteric fever surveillance was initiated in November 2017 and it continued up to December 2019, recruiting children aged < 15 years, residing in the study area. All enrolled children underwent active weekly inspection either through personal home visits or through telephonic interviews for 24 months or until they attained 15 years of age, whichever was earlier. Fever cases were identified through a weekly surveillance and any febrile episode meeting the criteria for suspected typhoid fever was reported at the field clinic and blood samples were collected for three consecutive days for culture. A pre-tested questionnaire was administered to collect information on demography, assets, socio-economic status, cooking fuel, access to safe water, sanitation, and hygiene practices from the households at the baseline. The study concluded on January 2020. Total 5,991 children were enrolled and underwent active surveillance; 258 children were lost to follow up during the study period. 93 culture-confirmed cases of enteric fever were reported (Table 4). Majority of the typhoid cases, 36 (44.4%) occurred in the younger age group of 6 months to < 5years. The composite WaSH scores generated from the three domains, water, sanitation, and food hygiene, was a score that ranged from 0-21, with a median value of 3. The score was dichotomized based on tertiles, with the lowest tertile categorized as poor WaSH practice (Table 5). The present study revealed the WaSH scenario in the urban slums of Kolkata, and the results are very similar to the findings from other studies done in identical settings (Fig 24,25, 26).

Table 4 : Overall Study Status

Events	Numbers
Total enrolled subjects	**6017**
- Subjects enrolled between 6 months and 4 years 364 days	2017
- Subjects enrolled between 5 years and 9 years 364 days	2000
- Subjects enrolled between I0 years and I3 years 364 days	2000
Total number of Fever episodes identified	17751
Total number of Suspected Typhoid Fever (STP) cases identitied	4286
Total number of blood culture reported	2290
Positive cases	**93**
- S_Typhi	80
- S. Paratyphi	13

Table 5 : Indicators of water, sanitation and hygiene practices used to develop composite WaSH score

Drinking water score	**Sanitation score**	**Hygiene score**
Source type	*Toilet facility*	*Food hygiene*
Individual supply (3)	Individual sanitary latrine (3)	Cooked food from street vendors
Shared supply (1)	Individual pit latrine (2)	Breakfast from street vendors
Public supply (0)	Any shared latrine/ public (0)	Eating raw fruits/ vegetables
	Open defecation (0)	Ice cream from street vendors
Water treatment	*Disposal of child's stools*	For all the above consumption patterns :
Yes (3)	Child uses individual latrine (3)	Never (3)
No (0)	Child uses shared latrine (l)	Seldom (2)
	Stools rinsed in latrine (l)	Frequently/ Occasionally (0)
	Stools rinsed in drain/ditch or disposed in garbage or left in the open (0)	
Possible score: 0-6	**Possible score: 0-6**	**Possible score: 0-12**

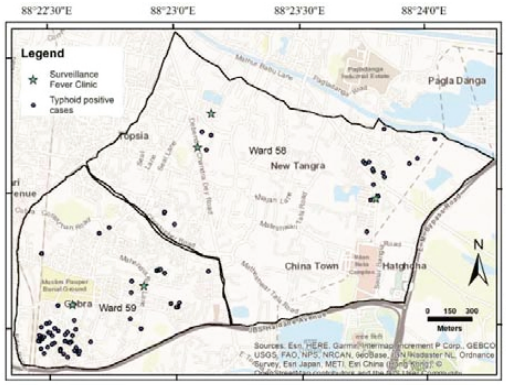


Fig 24: GPS Location of typhoid positive cases

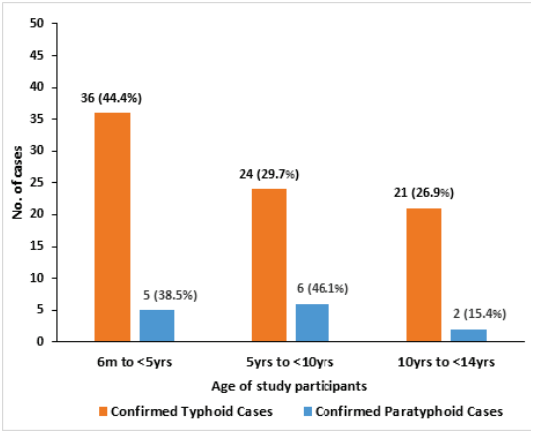


Fig 25: Stratum-wise distribution of culture-positive cases of typhoid fever (n=80) and paratyphoid fever (n=13) among participants of enteric fever surveillance in eastern Kolkata 2017-2019.

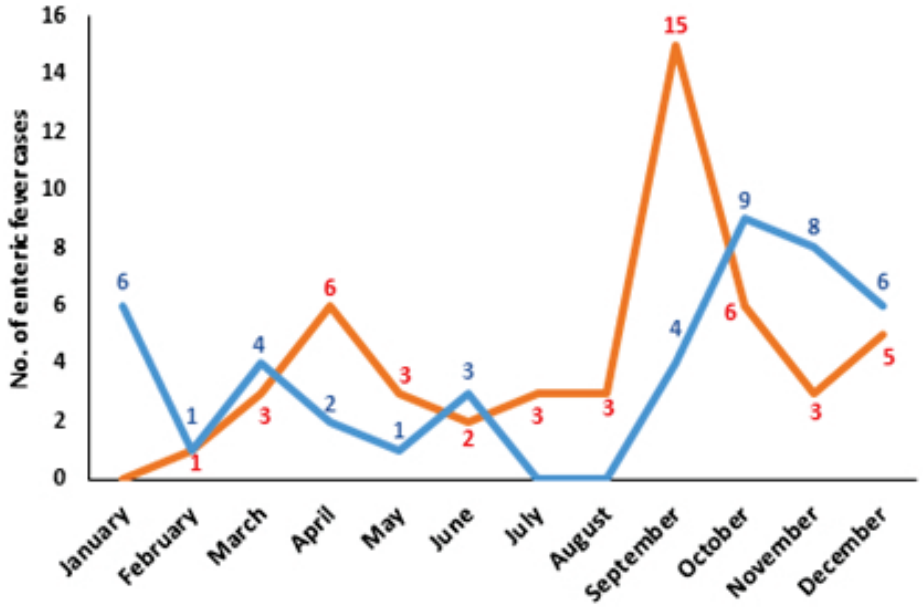


Fig26: Seasonal trend of enteric fever cases (n=93) among participants of enteric fever surveillance in eastern Kolkata 2017-2019.

Immunogenicity and Safety of Rotavac® and Rotasiil® Administered in an Interchangeable Dosing Schedule among Healthy Indian Infants: A Multicentric, Phase IV, Open-Labeled, Randomized, Controlled Trial

Principal Investigator : Dr. Shanta Dutta, Director and Scientist G
Site Principal Investigator : Dr. Suman Kanungo, Scientist E, ICMR- NICED

The study was designed to look whether the mixed regimen of the two currently available rotavirus vaccine i.eRotavac® and Rotasiil®, in public health practices in India are interchangeable in terms of safety and immunogenicity so that the coverage of vaccination can be scaled up across the country. The study showed that the two vaccines are interchangeable in terms of both safety and immunogenicity.

RVICS study field activities and dosing

Table 6: Details of study participants at the two sites :

Site	Consented	Screen Failed/ Consent Withdrawal	Randomized	Visit 1	Visit 2	Visit 3	Visit 4	Early Termination
ICMR-NICED	1067	78	989	989	956	936	907	82
KEM	1042	52	990	990	969	958	945	45

A Multicenter, Phase III, Double-Blind, Randomized, Placebo-Controlled Study to Evaluate the Efficacy of Recombinant BCG VPM 1002 In Reducing Infection Incidence and Disease Severity of SARS-COV-2/COVID-19 Among High-Risk Subjects

Principal Investigator: Dr. Shanta Dutta, Director and Scientist G
Site Principal Investigator: Dr. Suman Kanungo, Scientist E, ICMR- NICED
Co-Investigator: Dr. Ranjan Kumar Nandi, Scientist F, ICMR- NICED

This is a placebo controlled, randomized, double blind, adaptive study conducted to evaluate the reduction in infection incidence and severity of COVID-19 infection among high-risk subjects by enhanced trained immune response through VPM1002 vaccine (recombinant Mycobacterium bovisBCGΔureC::Hly+).A total of 5946 subjects in India who fulfil all the eligibility criteria were randomized to receive a single dose (0.1 ml) of either VPM1002 or placebo, administered as an intradermal injection.

Table 7: rBCG- Overall Study Status

Event	Date / Number
Date of SIV	12 Jun 2020
1st subject enrollment	15 Jun 2020
Total Number of Subjects consented	174
Total No. of Screen Failure Subjects	33
Total No. of Subjects Randomized	141
Total No. of Subjects Dosed	139
Number of subjects consented to provide Serology	134
Total No. of SAE	02 (Both resolved without sequel)
No. of COVID-19 RT-PCR test performed	57
No. of RT-PCR Positive cases	16
Severity grading & Outcome of COVID-19 positive cases	**Severity-**Mild-16 **Outcome-**Recovered without sequel-16

rBCG Study team

An Event-Driven, Phase3, Randomized, Double-blind, Placebo-controlled, Multicenter Study to Evaluate the Efficacy, Safety, Immunogenicity, and Lot-to-Lot consistency of BBV152, a Whole-virion Inactivated SARS-CoV-2 Vaccine in Adults ≥ 18 Years of Age.

Principal Investigator: Dr. Suman Kanungo, Scientist E, ICMR- NICED

This is a DCGI approved ongoing multi-centric Phase III efficacystudy, where 25,800 participants were enrolled to evaluate the protective efficacy, immunogenicity, and safety of BBV152 an indigenous whole virion inactivated COVID-19 vaccine developed by Bharat Biotech in partnership with ICMR and NIV. Participants aged 18 years and above were enrolled and randomized in a 1:1 ratio to receive BBV152 vaccine or placebo following consenting and screening. COVID-19-confirmed cases are captured by enhanced active surveillance and all attempts are made to collect a nasopharyngeal swab from the suspected cases. On primary analysis from the first 130 virologically confirmed symptomatic cases, VE-77.8%[95%CI:65.2-86.4] was estimated and success criteria was considered to be achieved. The study is ongoing.

Table 8: COVAXIN Phase-III- Overall Study Status

Event	**Date/Number**
Date of first subject enrollment	01 Dec 2020
Total Number of Participants consented	1005
Total No. of Screen Failure	18
Total No. of Subjects received first dose	987
Total No. of Subjects received second dose	967
Unblinding status	Vaccine group-511
Placebo group-476	
Total number of Serious Adverse Event(SAE)	04. All of them recovered and assessed to be not related to the study vaccine.

Strengthening / promoting evidence-based advocacy for influenza prevention and control in India

Principal Investigator : Dr. Suman Kanungo, Scientist E
Co-Investigator : Dr. Alok Chakrabarti, Scientist E
Funding Agency : All India Institute of Medical Sciences, New Delhi in collaboration with Centre for Disease Control and Prevention, Atlanta, USA
Period : 2017-2021

A primary outcome of this project is to provide robust national estimates for burden and economic impact of influenza- and RSV (Respiratory Syncitial Virus) -associated ARI, ALRI, outpatient visit and hospitalization among elderly people aged more than 60 years at four sites in India. A total of 1500 elderly with their written informed consent were enrolled from Kolkata site in June 2018 and the community influenza surveillance was started from July 2018 by trained nurses through weekly household visit and on open data kit (ODK) modules on handheld tablets were used for data collection. Nasal and oro- pharyngeal specimens of ARI cases were collected on dacron swabs and placed immediately into viral transport media on ice or ice pack, triple-sealed for transportation at NICED laboratory. In four hospitals, admitted patients (aged >=60 yrs) with ARI diagnosed by hospital with total duration of hospitalization not exceeding 48 hours were eligible for recruitment but enrolled after obtaining written informed consent. Nasal/oro-pharyngeal specimens were collected from all ALRI cases.During surveillance period from July 2018 to 2nd April, 2021, a total of 3,021 AURI and 171 ALRI have been detected from the community cohort. The positivity rate of Influenza A was 3.8% (35/920) in the community and 15.3% (44/288) in the hospital among enrolled SARI patients. The detailed laboratory result is given below

Table 9: Laboratory results from community and hospital samples

	Community	**Hospital**
Total Specimens collected	935	288
Tested for Influenza	920	288
Inf A	35(3.8%)	44(15.3%)
Inf A/PDMA(H1N1)	15	15
Inf A/H3N2	20	29
Inf B	23(2.5%)	2(0.7%)
Inf B /Yamagata	13	0
Inf B /Victo	10	2
RSV Positive	2	6

Sanipath-Typhoid and Environmental Surveillance Strategy

Principal Investigator: Dr. Shanta Dutta, Director and Scientist G
Co- Principal Investigator: Dr. Suman Kanungo, Scientist E

The study was designed to address the causal pathways of Typhoid in low-income urban settlement in Kolkata and to determine the survival and transmission of *S. Typhi* and *S. Paratyphi* A in the environment and to develop an environmental surveillance strategy to supplement and strengthen the clinical surveillance. The study was conducted in Kolkata by ICMR-NICED, India, in collaboration with the Emory University, USA across the city from May, 2019 to March, 2020. The urban slums in Kolkata are densely populated conglomerations of pollution characterized by narrow streets and lanes, having shared piped intermittent water supply and toilet facilities. Additionally, the sewage is deposited in open gutters that overflow during rains. Here we tried to identify the hot spots of typhoid burden in the city by examining various sewage samples from different pumping stations across the city and pooled latrines from the households of the typhoid clinical surveillance of ICMR-NICED (Table 11). Environmental Exposure Assessment comprises of Behavioural Study (Household survey, Community Survey, School Survey, Structured observation of Food preparation and Child Observation) and Environmental Pathway Sample Collection (drinking water, stored water for household chores, surface water, soil, open drain water, raw produce, street food, swabs from public latrine) (Table 12). The Environmental Surveillance comprise of Moore swabs and Pooled latrine triggered samples. In Kolkata (KMC area) four Neighbourhoods, including very low, low and middle to high income groups, were selected from which behavioural data and environmental exposure samples were collected. The study is completed and analysis is ongoing.

Table 10 : Laboratory results from community and hospital samples

	Community	Hospital
Total Specimens collected	935	288
Tested for Influenza	920	288
Inf A	35(3.8%)	44(15.3%)
Inf A/PDMA(H1N1)	15	15
Inf A/H3N2	20	29
Inf B	23(2.5%)	2(0.7%)
Inf B /Yamagata	13	0
Inf B /Victo	10	2
RSV Positive	2	6

Specimen collection from ARI cases by nurse

Sample Collection from Open Drain

Collection of Pooled Latrine

Table 11 : Sewage samples collected from pumping stations

Sample type (N)	*E. coli* (Log10 CFU/ml) Mean (SD)	MST results (without re enrichment)	
		n/N (%) positive for SOMCPH (W G-5)	n/N (%) positive for Bacteriodes (GB124)
Moore swabs (233)	NT	NT	NT
Large volume samples (28)	6.37 (0.67)	20/21 (95)	20/21 (95)

N. total number of samples collected: NT, not tested

Sample type (N)	PCR results (no tested positive/ total tested) *S.* Typhi		Av, range of Ct value *S.* Paratyphi A	
Moore swab (233)	121/138 (88%)	*tvi*B (27.38 (22.53 - 31.82), *sta*G (29.44, 24.95 - 33.91)	87/116 (75%)	(32.81 (25.72-38.25)
Large volume samples (28)	13/24 (54.2%)	*tvi*B (25.13, 16.24 - 30.50), *sta*G (31.27, 26.79 - 33.77)	TBT	

TBT, to be tested

Table 12: Shared household toilets-case-associated and non-case associated

Sample type (N)	No. tested*	*E. coli* (Log10 CFU/ml) Mean (SD)	MST results (without pre enrichment)	
			n/N (%) positive for SOMCPH (WG-5)	n/N (%) positive for Bacteriodes (GBIZ4)
Sewage from case-associated shared toilets (225)	166	6.79 (1.11)	166/166 (100)	51/166 (31)
Sewage from non-case-associated shared toilets (38)	11	5.81 (0.81)	11/11 (100)	2/11 (18.2)

*some of the samples could not be tested for *E coli* due to delay in availability of mcoliBlue reagent at NICED

Sample type (N)	PCR results (no tested positive/ total tested) *S.* Typhi		Av, range of Ct value *S.* Paratyphi A	
Sewage from case-associated shared toilets (225)	33 / 176 (18.7%)	*tviB* (25.91, 15.26 - 32.42) *staG* (27.83, 18.30 - 33.96)	20 / 130 (15.4%)	36.61 (33.01 - 39.60)
Sewage from non-case-associated shared toilets (38)	0 / 11		2 / 13 (15.4%)	36.60 (36.35 - 36.83)

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Deputed to ICMR Hqtr in March 2020 to May 10 2020 to be part of the rapid response team for COVID 19
- Attended 7th Meeting of The GTFC Working Group On Oral Cholera Vaccine Webinars November 19 - December 10, 2020, Virtual Event

D. Chakraborty (Principal Investigator), Epidemiology and Data Management Division

A facility based cross sectional study on status of nutrition, immunization and chemoprophylaxis in Children Living with HIV/AIDS (CLHIV) aged 1- 14 years in a tertiary hospital, Kolkata, India.

This cross-sectional study is planned to estimate prevalence of malnutrition, immunization coverage, chemoprohylaxis adherence and factors associated based on assessment of 400 HIV infected children (1-14 years) registered Pediatric Centre of Excellence at Medical College & Hospital, West Bengal. The study is being conducted over three years through consecutive sampling where demographic, clinical, dietary, immunization related data will be analyzed along with assessment of serum Vitamin D, Ferritin, Zinc. Thus this study will generate evidence on nutritional, immunization and chemoprophylaxis status and adherence gap if any in reference to national guidelines for HIV infected children for further policy direction.

List of Conferences / Seminars / Workshops / Meetings / Trainings Attended / Organised

- Organized and attended First meeting of Rational Use of Medicine Consensus (RUMC) Committee at ICMR-NICED on 17th December 2020.
- Attended virtual meeting of Nodal Communication Officer on May and October 2020 conducted by ICMR & GHS. Presented the salient achievements of 2019 and future plan in terms of ICMR- NICED`s media endeavours
- Attended Virtual Social Media Training Workshop series on Basic Communication, Opinion Editorial, Facebook, twitter, Parliament Question etc conducted by ICMR & GHS
- Attended meeting of WHO- GTFCC on Cholera control endeavor of ICMR- NICED.
- Attended meeting of WHO- SEARO on WHO Collaborating Centre endeavor of ICMR- NICED.
- Attended virtual meeting and training on National COVID -19 Serosurvey and its implementation in West Bengal conducted by ICMR HQ & ICMR – NIE.
- Attended virtual ICMR training on Roles & Responsibilities of Ethics Committee Member organized by ICMR – Bioethics Unit, ICMR- NCDIR Bangalore on 16th March 2021.
- Attended meeting on implementing National Programme on Climate Change and Human Health as Centre of Excellence (COE) in climate change & water borne disease conducted by National Centre for Disease Control (NCDC), New Delhi
- Participated in Awareness Session as speaker on Health & Hygiene during COVID times at Birati Book Fair in North Dum Dum Municipality in January 2021
- Acted as an evaluator in Policy Case Competition on “Infection Prevention & Control” organized by IIT Roorkee in March 2021.

F. Debnath (Principal Investigator), Epidemiology and Data Management Division

Anti-Microbial Resistance Research & Evidence Synthesis for Stewardship implementation and Surveillance program development framework assessment (AMRES)

Investigator: Dr. D. Chakraborty

A major study titled Anti-Microbial Resistance Research & Evidence Synthesis for Stewardship implementation and Surveillance program development framework assessment (AMRES)" has been approved by scientific advisory & Ethics review committee of ICMR-NICED. Currently, institute has placed it to the state health department for approval. This study aims to understand the antimicrobial resistance pattern, prescription practices and community antibiotic consumption behavior and to assess preparedness of public health systems for implementing Antimicrobial Stewardship Program through a multidisciplinary consensus network approach. It eventually will contribute in development of framework for broader AMR Surveillance Program as well as strengthening the implementation of AMSP across all tiers of health system through development of framework.

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Attended first meeting of Rational Use of Medicine Consensus (RUMC) Committee at ICMR- NICED on 17th December 2020.Attended International Science Festival 2019 at Kolkata.
- Attended virtual meeting and training on National COVID -19 Serosurvey and its implementation in West Bengal conducted by ICMR HQ & ICMR – NIE
- Participated in the online "Publishing Webinar-Tips from Editor" organized by ICMR in collaboration with The Lancet Digital Health on 30th March 2021.

M. Bhaumik (Principal Investigator), Immunology Division

Gut microbial butyrate exploits AUF1-Dicer1-miR122 pathway for cholesterol homeostasis

Although the association of anti-hypercholesterolemia and gut derived butyrate is well known, the mechanism by which it decreases cholesterol is poorly understood. Here we have studied the molecular mechanism of butyrate action. Butyrate treatment to HFD fed C57BL/6 mice found to downregulate a number of hepatic cholesterol synthesizing and upregulate catabolizing genes to support cholesterol homeostasis. We showed for the first time an additional mechanism of butyrate action by showing that butyrate upregulated cholesterol efflux protein, ABCA-1 but not ABCA-5 bydownregulating miR27a in liver and experimentally demonstrated in hepatic cell line Huh7 that indeed butyrate favoured cholesterol efflux from cholesterol loaded cells.We dissected the molecular mechanism of butyrate action in Huh7 cells and showed that butyrate treatment upregulated two out of four isoforms of RNA binding protein, AUF1^{p40} and AUF1^{p37} which lead to Dicer1 instability and reduced biogenesis of miR122, resulting in lowering of cellular cholesterol. To show that AUF1 is indeed the fulcrum point in the process, using siRNA mediated silencing of AUF1, we showed an increase in Dicer1, miR122, and cellular cholesterol regardless of butyrate treatment establishing a tentative link of the cellular players: AUF1-Dicer1-miR122 working in tandem and designated as an axis. The axis found to operate in three independent gut dysbiosis mice models – induced by HFD or antibiotic treatment or colitis showing reciprocity between faecal butyrate and serum cholesterol level. We propose a new paradigm of butyrate action on cholesterol homeostasis in gut dysbiosis models, where RNA binding protein AUF1 is a key player.

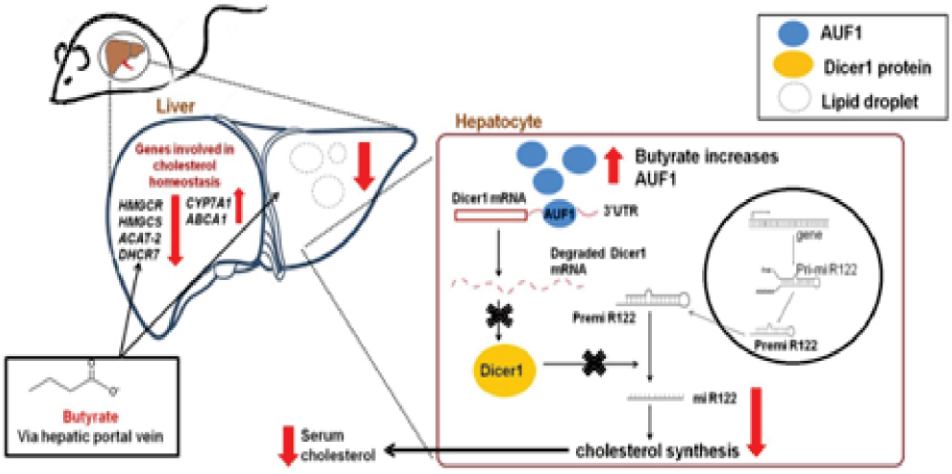


Fig 27: Schematic representation of putative mechanism of butyrate decreasing cholesterol synthesis by AUF1-Dicer1-miR122 axis.

Assessment of prophylactic and therapeutic role of BCG against SARS CoV2 infection: study in hamster model

Based on epidemiological studies reporting Bacillus Calmette– Guérin (BCG) vaccination in past may protect from COVID-19, several countries like Netherlands and Australia launch clinical trials to test the protective benefit of intracutaneous administration of BCG vaccinein health-care workers (ClincialTrials. Gov identifiers NCT04328441 and NCT04327206). Most of the data is based on ecological study suggesting less COVID-19 in countries with routine BCG immunisation is prone to be confounding. So, until the trials are complete it is important to evaluate the off target beneficial effect of BCG against COVID 19. To determine the protective effects of BCG against SARS CoV2 infection, innate functions of the macrophages derived from mice and hamsters were studied with BCG stimulation. The study included cytokine production, superoxide generation and antigen presentation assay. Our data showed significant increase in cytokine production and antigen presentation BCG treated macrophages compared to untreated control. We have also observed splenocytes from BCG immunized hamsters produced significant amount of IFN-g and TNF-a when recalled with tuberculin (specific antigen) and heat killed influenza (non-specific antigen) with respect to control. This provides a clear picture of the specific and non-specific stimulation of macrophages upon BCG treatment. Further studies will be conducted in hamsters to find whether the non-specific stimulation can protect against SARS CoV2 infection.

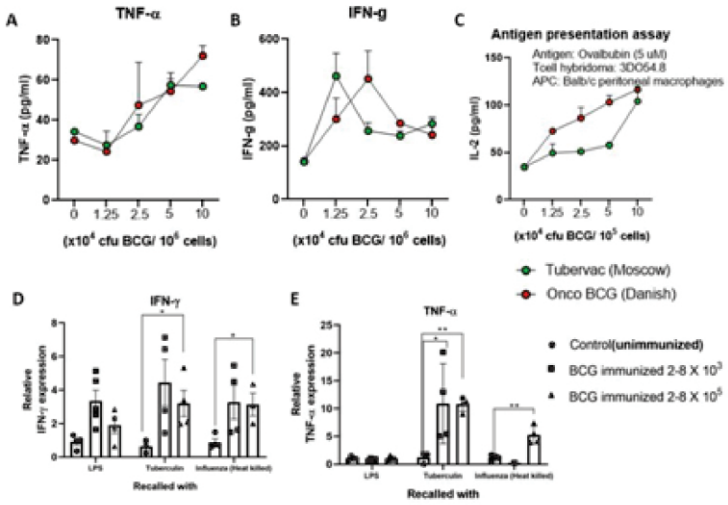


Fig 28: 10^6 cells/ml splenocytes from Balb/c mice were treated with the function of BCG concentration and incubated for 72 h. Thereafter the supernatant was collected and cytokines TNF-a (A) and IFN-g (B) were measured by ELISA. 10^6 cells/ml of peritoneal macrophages collected from Balb/c mice were treated with the function of BCG concentration and incubated for 24 h. Thereafter, the cells were washed and treated with ovalbumin (5uM) and 10^6 cells/ml ovalbumin specific T cell hybridoma (3DO54.8) for another 24 h. The sup was collected and IL-2 was measured by ELISA (C).
Hamsters (5-6 weeks old) were immunized with 2-8 X 10^3 and 2-8 X 10^5 BCG intradermally on day 0 and day7. On day 21 spleen was collected and splenocytes were isolated. The splenocytes were treated with either LPS (10 ug/ml) or tuberculin (5 ug/ml) or heat killed influenza (10ug/ml) for 48 h. The cytokine expression TNF-a (D) and IFN-g (E) were measured by qPCR.

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Attended and made poster presentation as Young Investigator at the 11th India Probiotics Symposium during 13th-14th March 2021. Title: Regardless of the nature of exogenous assault, lowering of gut microbial butyrate declines RNA binding protein AUF1 to induce hypercholesterolemia.

Pre-Doctoral Fellows:
Mr. Mainak Chakraborty, SRF-CSIR
Ms. Oishika Das, JRF-DST

S. Ganguly (Principal Investigator), Parasitology Division

Identification and Molecular Characterization of Common Enteric Parasites in Kolkata, Funded by ICMR (PI) 2016-2021.

In this year we targeted to characterize the genetic pattern of different isolates of *Entameoba moshkovkii* in context of the genes that are well known virulence factors. For this study PCR amplification of specific primers targeting locus of **lysine and glutamic acid rich protein 1 (kerp1)**, **chitinase** and **Gal/GalNAc lectin** gene were amplified and sequenced in different local isolates. We have successfully sequenced 3285bp long Gal/GalNAc lectin subunit Igl2 gene of *E. moshkovskii* gene of four isolates found in Kolkata. Sequence analysis of Gal/GalNAc lectin subunit Igl2 genes (complete sequence) confirmed the presence of three genotypes in four isolates. The SSRs (Simple Sequence Repeats) amplified from the samples revealed that there were four SSR variations in the KERP1 and three in the Chitinase. Each of the genes has been categorized into different sequence types from the isolates, based on the combination pattern of constructing units in the polymorphic regions. Seven genotypes were identified in KERP1 and four in Chitinase gene. The genotypes obtained in winter season are unique in comparison to the other season in all cases. The exclusive correlation of different isolates for winter versus monsoon was significant ($p = 0.0333$) for KERP1 gene whereas we did not obtained any significant data for Chitinase. After intracecal injection with trophozoites of *E. histolytica (HM1IMSS) and E. moshkovskii* in the ceca of CBA/J mice Scanning Electron Microscopy (SEM) of ceca revealed the presence of *E. moshkovskii* and *E. histolytica* infection in epithelial layer of ceca. The infection rate for *E. histolytica* is 100% (3 out of 3) and 66.66% for *E. moshkovskii* (2 out of 3). No mice were infected with *E. dispar*.

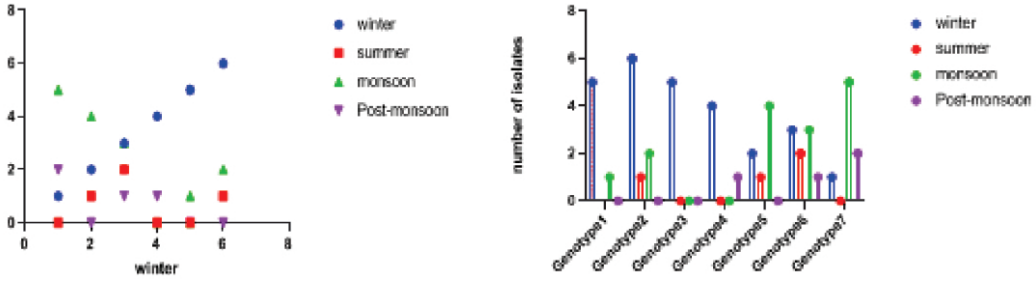


Fig: 29 : Correlation of different isolates obtained in different season based on kerp1 gene of *E. moshkovskii*. G2: Frequency of genotypes obtained in different season based on kerp1 gene of *E. moshkovskii.*

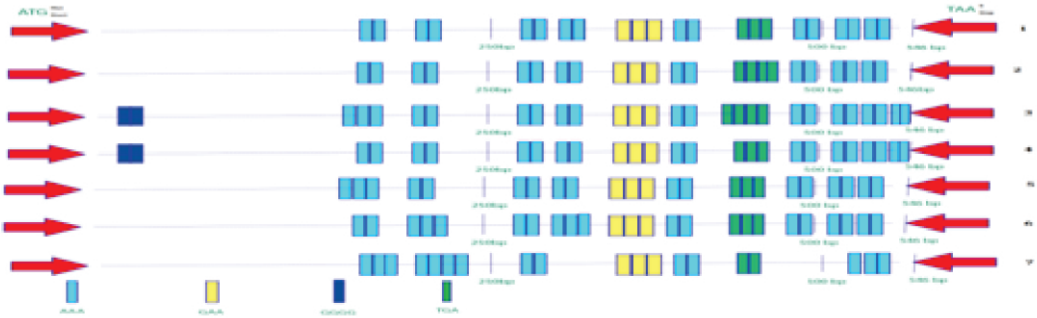


Fig 30 : Schematic representation of Polymorphism in kerp1 gene among the *E. moshkovskii* isolates obtained in different season.EmKrep1S1(Summer genotypes) 2. EmKrep1S2 (Summer genotypes) 3. EmKrep1S3(Winter isolates) 4. EmKrep1S4 (Winter genotypes) 5. EmKrep1S5 (Monsoon genotypes) 6.EmKrep1S6 (Monsoon genotypes) 7. EmKrep1S7 (Monsoon genotypes)

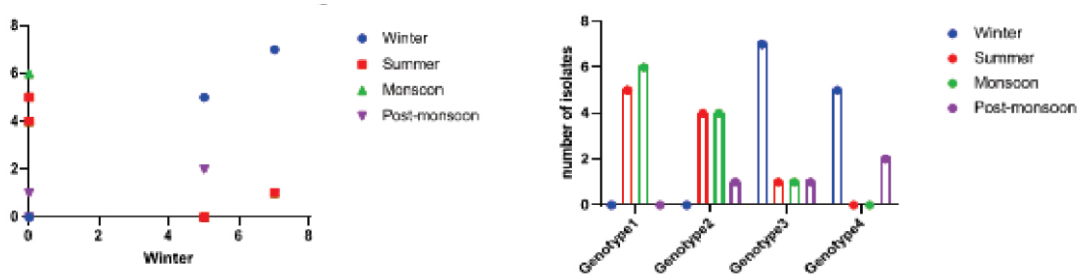


Fig 31 : Correlation of different isolates obtained in different season based chitinase gene of *E. moshkovskii*. G4: Frequency of genotypes obtained in different season based on chitinase gene of *E. moshkovskii.*

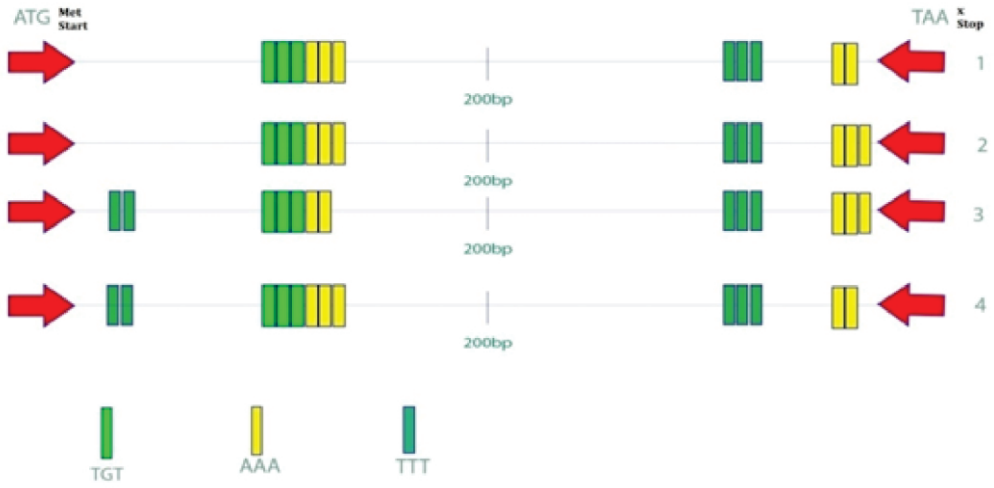


Fig: 32 : Schematic representation of Polymorphism in Chitinase gene among the *E. moshkovskii* isolates obtained in different season**.** EmChitS1 (Summer, Monsoon and post-monsoon genotypes) 2. EmChitS2 (Summer and Monsoon genotypes) 4. EmChitS3 (winter genotypes) 5.EmChitS4 (winter genotypes)

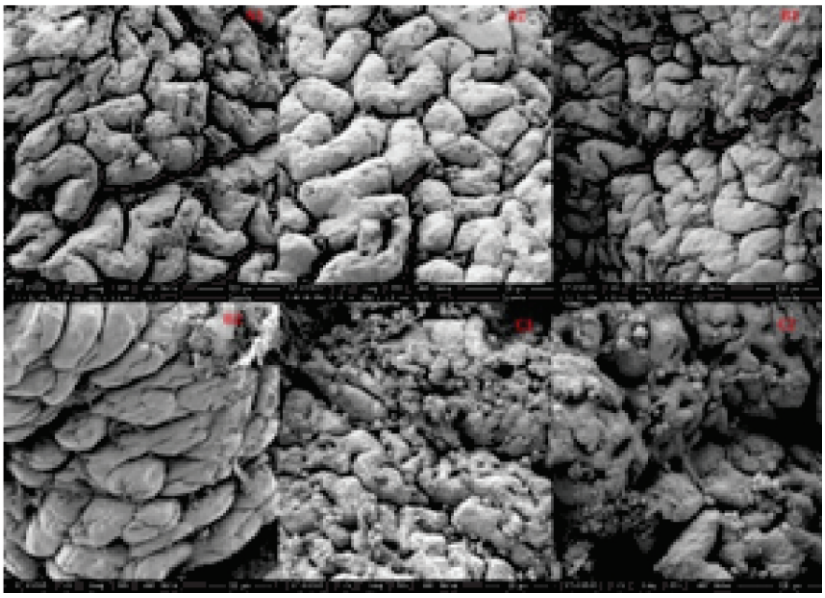


Fig 33: Scanning Electron microscopy; A1 & A2: Observations of ceca of CBA/J mice successfully infected with *E. moshkovskii*. B1 & B2: Observations of ceca of CBA/J mice not infected with *Entamoeba* spp. C1 & C2 Observations of ceca of CBA/J mice successfully infected with *E. histolytica*

The hospital based systemic surveillance, conducted in a study population in Kolkata, has identified *Giardia lamblia* as one of the major enteric parasites. A change in recent trend of *G. lamblia* prevalence has been observed, which necessitates characterization of the local isolates. Multilocus genotyping of local isolates of *Giardia lamblia* has enabled identification at sub assemblage level i.e. A1, A2, B3 and B4 (human infecting subtypes of Assemblage A and B), among which B3 (38.46%) was found to be prevalent in the study population. New variants of different subassemblages were obtained with genetic heterogeneity in some isolates, possibly due to allelic sequence heterogeneity in a single parasite or meiotic recombination. This finding suggests that there is a possibility of genetic exchange in this parasite which can change their pathogenic nature by altering the genes responsible for pathogenesis and drug tolerance.

The mechanism that contributes to disease caused by *Giardia lamblia* are multifactorial and involve an array of parasite and host factors. Cathepsin B family of cysteine proteases play a significant role in *Giardia* pathogenesis. The genome of the parasite contains numerous genes for this family of proteins and found to be involved in differentiation processes i.e. encystation and excystation and also in host pathogen interaction. Interestingly, one of the members has shown an unconventional expression pattern at transcriptomic level under oxidative stress, being upregulated as the trophozoites enter the death phase. We have been able to successfully clone the gene and sequence it. Immunization and preparation of polyclonal antibody from the recombinant protein is in process.

Table 13: Sub-assemblage Assignment of the current local human isolates of *Giardia lamblia*

SAMPLE NO.	BETA GIARDIN	TRIOSE PHOSPHATE ISOMERASE	GLUTAMATE DEHYDROGENASE
Isolate1	B3	B4	B3
Isolate2	A	A1	A1
Isolate3	-	-	A1
Isolate4	B	B3	B3
Isolate5	B	B3	B3
Isolate6	-	A2	A1
Isolate7	-	B3	B3
Isolate8	A	A2	A2
Isolate9	A1	A1	A1
Isolate10	B	B3	B3
Isolate11	B	B4	B3
Isolate12	B3	B3	B4
Isolate13	B	B3	B3
Isolate PORTLAND1	AI	A1	A1

Mixed Subassemblages

Identification of novel Anti-Parasitic Compound from Natural Medicinal source and their effect on *Giardia lamblia*.Funded by CSIR (PI) 2018-2023

Keeping in mind the MDR Giardiasis and also side effect commonly found anti parasitic drug, the aim of the present study was to determine whether *Andrographis paniculata* extract has any anti giardial activity and to identify if it could alter the gene expression level of *Giardia lamblia*. We assessed the mortality of *Giardia lamblia* exposed to different concentration of *A. paniculata* aqueous extract. The percentage of cell death varying extract concentration. Dose of 8mg/ml killed nearly 38% of the cells in 12 hours. Doubling the concentration to 16mg/ml lead to killing of 72% of the cells. The highest concentration in this case was 32mg/ml in which >90% of the cell died in 12 hours. Considering the cell death percentage with corresponding dose concentration it can be assumed the IC_{50} (50% inhibitory concentration) of the extract possibility lies just above the concentration of 8 mg/ml. The cell death activity and adherent property have shown the good result also.

In the current scenario, conventional drug failure and emerging drug resistance of parasites are the major obstacles towards control of the disease. The current treatments either one of a family of metronidazole, nitroimidazole, albendazole, are reported to have life threatening side effects, high toxicity, induction of parasitic resistance, length of treatment and high cost. New plant based treatments should be less toxic, safe more efficient less expensive and readily available and low income populations groups.This study indicates that *Andrographis paniculata* extract may be used as a potential phytotherapeutic agent.

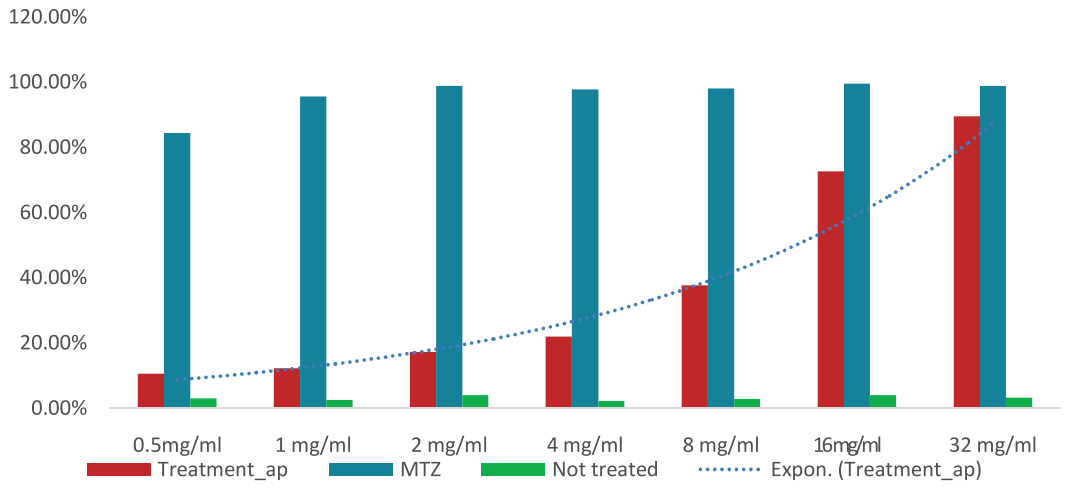


Fig 34: Dose Response Study using *Andrographis paniculate*leaf extract (12hrs. treatment)

Human Pulmonary Paragonimiasis in Crab Eating Communities and Smear Negative Suspected TB cases from some States of India. Funded by ICMR (PI) 2018-2021

Pulmonary paragonimiasis is often misdiagnosed as smear negative pulmonary tuberculosis due to overlapping clinical manifestations and radiological picture of the two diseases. Last year we perform Active community survey (door to door) among 8668 individuals (from April 2020 to March, 2021) and TB smear negative passive survey among PHC/DHC which means 1648 individual (from April 2020 to March, 2021). Previous year we assisted ICMR Dibrugarh team from 28th January 2021 to 19th February 2021, providing a brief interaction on surveillance coordination and communication. They started the faunal survey in Alipurduar district. Crabs were collected and dissected different parts of this district. We have tested 1217 passive serum samples and 603 active serum samples; 8708 stool and 9445 sputum samples were collected. Among these tested samples 1.15% IgG positive in passive tested samples and 1.32% IgG positive in active tested samples. Rests are stored in -20ºC temperature. We are awaiting more indigenous ELISA tested kit developed by ICMR-Dibrugarh for assay of the samples collected in future. 4272 freshwater crabs (Telo-kankra) were dissected to confirm the presence of metacercaria. Both the dissected crabs and obtained Paragonimusmetacercariae lookalike entities (suspected positive cases) were preserved as instructed (Crabs in 10% formalin and metacercariae in ethanol/PBS). This year two identified (*Sartoriana spinigera* (Telokankra), *Acanthopotamon martensi*) and one unidentified species of crab were found.

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Keynote Speaker in Biospectrum 2020 Organized by University of Engineering and Management, Microbiologists society and Indian Ecological Society virtually from 19-21 Nov, 2020.

Pre-Doctoral Fellow
Mr. Sanjib Kr. Sardar, SRF-ICMR
Ms. Ajanta Ghosal, SRF-ICMR
Mr. Md. Maimoon Maruf, SRF-CSIR
Mr. Tapas Haldar, SRF-CSIR

A. Pal (Principal Investigator), Pathophysiology Division

A novel therapeutic approach to kill cancer cells by microbial protease mediated proteasomal degradation of microtubule.

The main objective of this study was to search for microbial proteases which can induce apoptosis in cancer cells. A total of 140 environmental microbial strains were tested for protease activity. Only 5 strains showed significantly higher protease activity. All the 5 strains were tested in HT29 (colon cancer cells) for apoptotic effect. Flow cytometric analysis showed, one strain DHS 96 can induce apoptosis which was inhibited by PMSF. The protease was purified from DHS96 strains by ammonium sulphate precipitation, ion-exchange and gel filtration chromatography. SDS-PAGE showed presence of two bands and a single band was observed in Native PAGE. The amino acid sequence of the bands showed homology with 'subtilisin' having peptidase S8 domain. 16s rRNA sequencing and gene specific PCR confirmed the DHS 96 strain belongs to *Bacillus amyloliquefaciens*. Identified protease showed cell death in cancer cells (HT-29 and MCF-7) but not in normal cells (MCF-10A). Western blot analysis exhibit purified protease could not induce conventional pathway of apoptosis; rather it induced tubulin degradation in cancer cells, whereas in normal cells (MCF-10A) tubulin degradation was not observed. In-depth analysis showed 'subtilisin' activates ubiquitination and proteasomal mediated tubulin degradation which was completely restored when proteasome inhibitor MG132 was used. We further observed PARKIN, one of the known E-3 ligase over-expressed and interact with tubulin in 'subtilisin' treated cells. Apoptotic mechanism investigation revealed PARKIN activation and Tubulin degradation leads to ER-stress, which in-turn activate caspase-7 and PARP cleavage, thus guide the 'subtilisin' treated cells towards apoptosis.

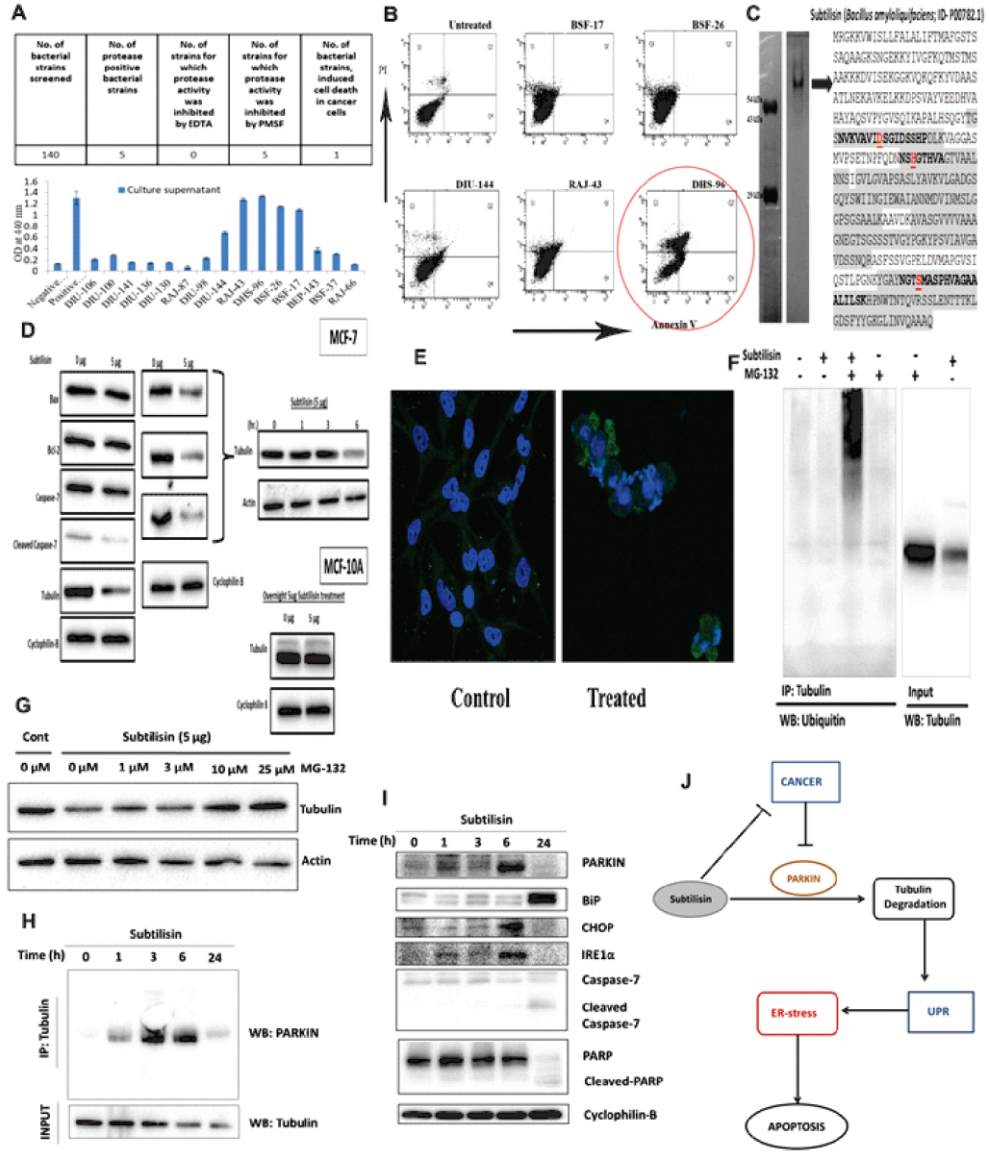


Fig: 35. (A) Total number of strains screened with protease and apoptosis positive strains along with their inhibition pattern is represented in a tabular form. Azocasein (0.7%) assay was done to check the protease activity for all 140 strains. (B)Flow-cytometric analysis for determination of apoptosis was performed with the culture supernatant of the protease positive

strains. DHS-96 strain showed significant apoptosis. In each display the lower right quadrant is for early apoptotic cells (Annexin V+/PI-), the upper right is for late apoptotic cells (Annexin V+/PI+) and the upper left is for necrotic population (Annexin V-/PI+). (C)SDS-PAGE (12%) and Native-PAGE (12%) profile of proteins eluted in G-75 column. The band was analysed by MS/MS peptide sequencing and identified as 'subtilisin'. The peptide showed homology with 'subtilisin' is shown with background colour. The S8 domain of subtilisin is shown as bold with the catalytic triad of D, H and S (underlined). **(D-E)** Subtilisin does not induced Pro and anti-apoptotic protein rather it promotes tubulin degradation in cancer cells. (**F)** Subtilisin showed ubiquitination of tubulin in MCF-7 cells. (**G)** Proteasomal inhibitor MG-132 restore tubulin degradation in MCF-7 cells in a dose dependent manner. (**H)** Co-Immunoprecipitation showed E3-ligase PARKIN interacts with tubulin in 'subtilisin' treated after 3 hrs onward. **(I)** ER-stress marker increases in MCF-7 cells after 6hrs of 'subtilisin' treatment, particularly CHOP, IRE1-α and BiP. It has also been found that **(J)** Figures shows the proposed model for 'subtilin' mediated apoptosis pathway in MCF-7 cancer cells.

Post and Pre-Doctoral Fellows

Post-Doctoral Fellow:
Dr. Tanusree Ray, ICMR RA III

Pre-Doctoral Fellow:
Ms. Nanda Singh, SRF-CSIR
Mr. Niraj Nag, SRF-UGC
Mr. Saibal Saha, JRF-UGC

M. K. Saha (Principal Investigator), Virology Division

Behavioral Surveillance Survey – Lite (BSS-Lite)

Consistent endeavor of National AIDS Control Organization over the various National AIDS Control Program is to have more granular, updated, and geographically & population representative bio-behavioral information made available to inform the HIV prevention and treatment program.Behavioral information is a critical information source indicating the extent to which AIDS response is having an impact on behaviours of specific key population groups so that accordingly efforts can be adjusted or intensified. It also acts as an early warning system of population groups at risk for HIV in specific locations. In view of this, BSS-Lite has been proposed to be implemented during 2019 with an objective to estimate the prevalence of HIV related risk and safe behaviors, knowledge, attitude and practices and service uptake among key population groups. Findings from BSS-Lite will -also be used to work out appropriate correction factors for the behavioral component of the HSS Plus.

BSS-Lite Activities

BSS-Litewas implemented in 14 States for the population groups of Female Sex Workers (FSW), Men who have Sex with Men (MSM), Injecting drug Users (IDU) and Hijras/Transgender (H/TG) people. Regional Institute at ICMR-NICED was responsible for implementation of the BSS-Lite in 2 States- Nagaland and West Bengal.
There were three distinct technical implementation phases of the BSS-Lite: a) Sampling Frame Development, b) Cluster Selection, and c) Behavioural Survey.

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- National Pre-Surveillance Meeting for HSS Plus 2020-21 was held in virtual mode during12th – 14th October 2020 organized by All India Institute of Medical Sciences (AIIMS), New Delhi. Regional Institute (RI) team members were attended the training program.
- State level training for HSS 2020-21 (ANC Round) for West Bengal during 4th& 5th January 2021 (virtual training) and 11th& 14th January 2021 (physical training). RI team member and SST members of West Bengal attended the training program as resource person.
- HSS Training-West Bengal
- HSS Training-Chhattisgarh

- State Pre-Surveillance Meeting cum Training of HSS Site Personnel of Chhattisgarh held in virtual platform during 5th & 6th January 2021. RI team member and SST members of Chhattisgarh attended the training program as resource person. Physical training for Chhattisgarh HRG site personnel held at Raipur during 20th – 23rd January 2021. RI project coordinator and SST members attended as resource person.

HSS Training-West Bengal

HSS Training-Chhattisgarh

- State level training for HSS 2020-21 (HRG Round) for West Bengal during 7th January 2021 (virtual training) and 15th& 19th January 2021 (physical training). RI team member and SST members of West Bengal attended the training program as resource person.
- HSS HRG site personnel training for Sikkim during 11th& 12th February 2021 in virtual platform. RI team member and SST members of Sikkim attended the training program as resource person.

M. Chawla-Sarkar (Principal Investigator), Virology Division

Rotavirus-Host Interaction Studies: Progressive Rotavirus infection down-regulates redox-sensitive transcription factor Nrf2 andNrf2-driventranscriptionunits

Eukaryotic cells adopt highly tuned stress-response physiology under threat of exogenous stressors including viruses to maintain cellular homeostasis. Thus, avoidance of cellular stress-response pathways is an essential facet of virus-induced obligatory host reprogramming. Adaptive cellular responses to oxidative and electrophilic stress are usually taken care of by ananti-oxidant defense system, core to which lies the redox-responsive transcription factor Nrf2 and Nrf2-driven transcriptional cascade. In the current study, we aimed to study the modulation of Nrf2-based host cellular redox defense system in response to Rotavirus (RV) infection *in vitro*. Interestingly, Nrf2 protein levels were found to decline sharply with progression of RV infection beyond an initial upsurge. Moreover, Nrf2 decrease was found to be accompanied by active nuclear vacuity of Nrf2, resulting in lowered expression of stress-responsive Nrf2 target genes Heme oxygenase-1 (HO-1), NAD(P)H Quinone `Dehydrogenase1and Superoxidedismutase1 (SOD1) both in presence and absence of Nrf2-driven transcriptional inducers. Initial induction of Nrf2 concurred with RV-induced early burst of oxidative stress and there fore was sensitive to treatments with anti-oxidants. Reduction of Nrf2 levels beyond initial hours, was found to be independent of cellular redox status. Further more, increasing the half-life of Nrf2 through inhibition of Kelch-likeery throid cell-derived protein with CNC homology [ECH]-associated protein 1/Cullin3/Ring Box1-based canonical Nrf2 turn-over pathway could not restore Nrf2 levels post RV-SA11 infection. Depletion of Nrf2/HO-1 axis was subsequently found to be sensitive to proteasome inhibition with concurrent observation of increased K48-linked ubiquitination associated with Nrf2 (Fig 36). Together, the present study describes robustdown-regulation of Nrf2-dependent cellular redox defense beyond initial hours of RV infection (**Patra U et al 2020**, Oxid Med Cell Longeivity).

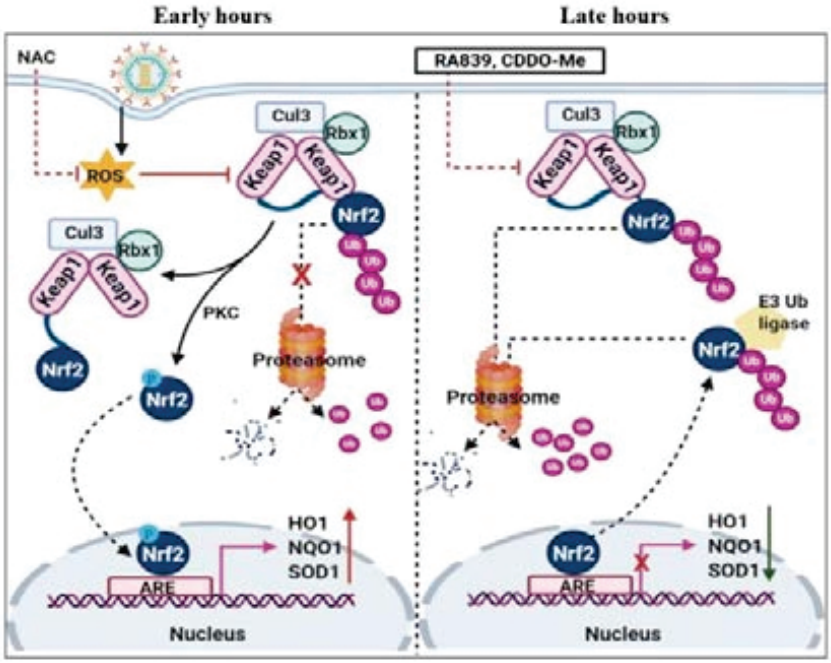


Fig 36: Schematic diagram showing the evasion of host cellular antioxidant system via bimodal regulation of NRF-2 by rotaviruses during infection.

Comprehensive analysis of the genomic diversity of SARS-CoV-2 in different geographic regions of India

The RNA genome of the emerging novel coronavirus is rapidly mutating, and its human-to-human transmission rate is increasing. Hence, temporal dissection of their evolutionary dynamics, the nature of variations among different strains, and understanding the single nucleotide polymorphisms in the endemic settings are crucial. Delineating the heterogeneous genomic constellations of this novel virus will help us understand its complex behavior in a particular geographical region. Therefore, we performed comprehensive analysis of 95 Indian SARS-CoV-2 genome sequences available from the Global Initiative on Sharing All Influenza Data (GISAID) repository during the first 6 months of 2020 (January through June). Evolutionary dynamics, gene-specific phylogeny, and the emergence of the novel

coevolving mutations in 9 structural and nonstructural genes among circulating SARS-CoV-2 strains across 12 different Indian states were analyzed. Phylogenetic analyses revealed the evolution of "genome-type clusters" and adaptive selection of "L"-type SARS-CoV-2 strains with genetic closeness to the bat severe acute respiratory syndrome–like coronaviruses. These strains were distant to pangolin or Middle East respiratory syndrome–related coronavirus strains (**Banerjee A et al 2020** JMIR).

Accumulation of mutations within the genome is a continuous driving force in viral evolution within an endemic setting. Therefore, we further carried out a genome-wide analysis of circulating SARS-CoV-2 strains to detect the emergence of novel co-existing mutations and trace their geographical distribution within India. Comprehensive analysis of whole genome sequences of 837 Indian SARS-CoV-2 strains collected during March 2020 to August 2020 revealed the occurrence of 33 different mutations, 18 of which were unique to India. Novel mutations were observed in the S glycoprotein (6/33), NSP3 (5/33), RdRp/NSP12 (4/33), NSP2 (2/33), and N (1/33). Non-synonymous mutations were found to be 3.07 times more prevalent than synonymous mutations. The Indian isolates classified into 22 groups based on their co-existing mutations. Phylogenetic analysis revealed that the representative strains of each group were divided into various sub-clades within their respective clades, based on the presence of unique co-existing mutations. The A2a clade was found to be dominant in India (71.34%), followed by A3 (23.29%) and B (5.36%), but a heterogeneous distribution was observed among various geographical regions. The A2a clade was highly predominant in East India, Western India, and Central India, whereas the A2a and A3 clades were nearly equal in prevalence in South and North India. This study highlights the divergent evolution of SARS-CoV-2 strains and co-circulation of multiple clades in India (**Sarkar R et al 2020** Arch Virol).

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Science Against SARS-CoV2, Virtual Conference, Oct 06-08 2020, Organized by Thermofisher : (Attendee)
- Sunil Chandra Bose memorial oration 2020 organized by West Bengal Academy of Science & Technology (WAST) on 19th Feb, 2021 : (Attendee)
- Invited lecture titled "Evolution & Emergence of new Viral Diseases: Lesson to learn from COVID-19 pandemic" at Victoria College, University of Calcutta on 27 Feb 2021.
- Invited lecture titled "COVID 19 : Facts and Myths about COVID-19 vaccines at Indian Science Congress, Calcutta Chapter on 8th March 2021.

PhD. Awarded

Dr. Upayan Patra was awarded PhD. From the University of Calcutta
Title of Thesis: An Integrated Proteomics-Based Approach To Gain Mechanistic Insights Of Host Factors During Rotavirus Infection"
Date of degree: 23rd March 2021

Pre-Doctoral Fellow

Ms. Urbi Mukhopadhayay, SRF-UGC
Mr. Rakesh Sarkar,SRF-UGC
Mr. Mahadeb Lo, SRF-CSIR
Ms. Priyanka Saha, SRF-DBT
Ms. Suvrotoa Mitra, SRF-ICMR Project
Ms. Shreya Banerjee, JRF
Mr. Ritubrata Saha, JRF

A. Chakrabarti (Principal Investigator), Virology Division

Nationwide screening of phage types of *V cholerae* O1 and O139

Vibrio phage Reference Laboratory of NICED is a referral laboratory which is engaged in phage typing study of *V.cholerae* O1 biotype ElTor strains over last couple of decades toprovide service to the nation on phage typing of *V.cholerae* strains. As a National center ICMR-NICED use to receive strains from different medical colleges, hospitals and research institutes around the country of India for bio-typing, sero-typing and phage typing study. ICMR-NICED use to receive strains from different medical colleges and research institutes around the country of India for bio-typing, sero-typing and phage typing study.

Due to unprecedented COVID-19 pandemic situation,regular sample arrival from different hospitals were interrupted in the year 2020-21, our center received very few samples this year which were characterized by phage typing using a panel of typing phages available with us at the Vibrio Phage Reference Laboratory.Strains received were confirmed as *V.cholerae* O1 biotype ElTor and were serotyped using the panel of antisera available with us. Phage typing was performed using the sets of typing phages available with us.

The strains were discriminated into two different types using the conventional scheme of Basu and Mukherjee. Using the new phage typing scheme phage type 27 was found as the predominant type.Moreover, we have isolated new phages against *V.cholerae* O1, *Shigella* and *Salmonella*sp. New pahges isolated for *V.cholerae* O1 biotype ElTor are under characterization.

Future plan: This study will be continued to determine phage types of *V.cholerae*. New bacteriophages will be isolated and characterized.

Functional evaluation of the role of PBI-N40 Protein of influenza virus in apoptosis and inflammation

PB1 and PB1-N40 genes of influenza A virus and TRIM32 (E3-ubiquitin ligase) an antiviral host factor were cloned into mammalian expression vectors. Co-immunoprecipitation was performed to understand the interaction between IAV PB1 and host antiviral protein TRIM32.It was found that PB1-N40 was not associated with apoptosis and PB1-N40 has no role in the regulation of inflammation.The functional importance of PB1-N40 protein in the life cycle of Influenza A virus has been studied with TRIM32 which is an E3-ubiquitin ligase.Because ORF-1 of influenza A virus second gene segment encodes two proteins (PB-1 and PB1-N40), to understand the role of PB1-N40 in influenza virus lifecycle, construction of PB1-N40 deleted virus in essential. Start codon methionine of PB1-N40 was mutated by a single base substitution into Isoleucine by site-directed mutagenesis, and amplification of whole second segment of influenza A virus by Hoffman universal primer was performed. Mutated second gene segment was cloned into pHW2000 and pAc-GFP-C2 vectors.Mutated second segment and other 7 segments of influenza A virus was transfected into HEK293 cells and a PB1-N40 deleted virus has been rescued using reverse genetics system.This will be useful to study the role of PB1 and PB1 N40 proteins individually.

*Future Plan:*Interactions between PB1-N40, PB1 and TRIM32 will be analysed in details by co-immune precipitation, co-immune blotting and bioinformatics analysis.

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

- Provided training to the workshop participants on Real time PCR for diagnosis of viral diseases. Participants were trained to work in their center to detect viruses from clinical samples following the standard protocol as recommended by WHO.
- Delivered a lecture entitled "**Emerging and re-emerging high risk pathogens and role of containment laboratories"** in the **Training Workshop on Biosafety and Biosecurity** on 15th December 2020 organized by Regional Virus Research and Diagnostic Laboratory. During this training workshop I was involved in laboratory training of the participants on Real time RT-PCR to diagnose virus from clinical samples. I have delivered a lecture on "**basics of PCR and Real time PCR"**
- Provided Training on **Detection of SARS-CoV-2 using Real Time RT-PCR (COVID-19 RT-PCR) to participants of Murshidabad Medical College** on 09-04-2020
- Provided Training on **Detection of SARS-CoV-2 using Real Time RT-PCR to participants of Command Hospital, Kolkata** on 13-04-2020.

- Department of Physiology, Ananda Mohan College, Kolkata organized a Webinar on the theme "Translational Physiology: From Cell to System". Delivered an invited lecture in this web meeting on 18th September, 2020 on a topic entitled "**Influenza: the virus, epidemics, pandemics and continued pandemic threat**" organized by Department of Physiology, Ananda Mohan College.
- Delivered an invited lecture entitled "**Pandemic potential of influenza viruses**" on October 13, 2020 in aweb meeting namely "New horizons of therapeutic targets in antiviral drugdiscovery" organized by RBVRR Women's college of pharmacy,Osmania University,Hyderabad.

Pre-Doctoral Fellow
Mr. DevendranathTewari, SRF-UGC
Ms. Sampurna Biswas, SRF-ICMR
Mr. ParthaPratim Mandal, JRF-UGC
Mr. Sanjoy Biswas, JRF-UGC
Ms. Deborima Chatterjee, JRF-UGC

N. Chakrabarti (Principal Investigator), ICMR-NICED Virus Laboratory

Strategy to study screening of anti-CMV (Cytomegalovirus) compounds from some medicinal and edible mushrooms

Objective:
Isolation and characterization of natural compounds like polysaccharides, terpenoids from some medicinal and edible mushrooms and to find out the mode of action of these compounds against HCMV like, DNA polymerase inhibition, inactivation of IE 2 proteins or other enzymes or proteins essential for DNA replication of HCMV

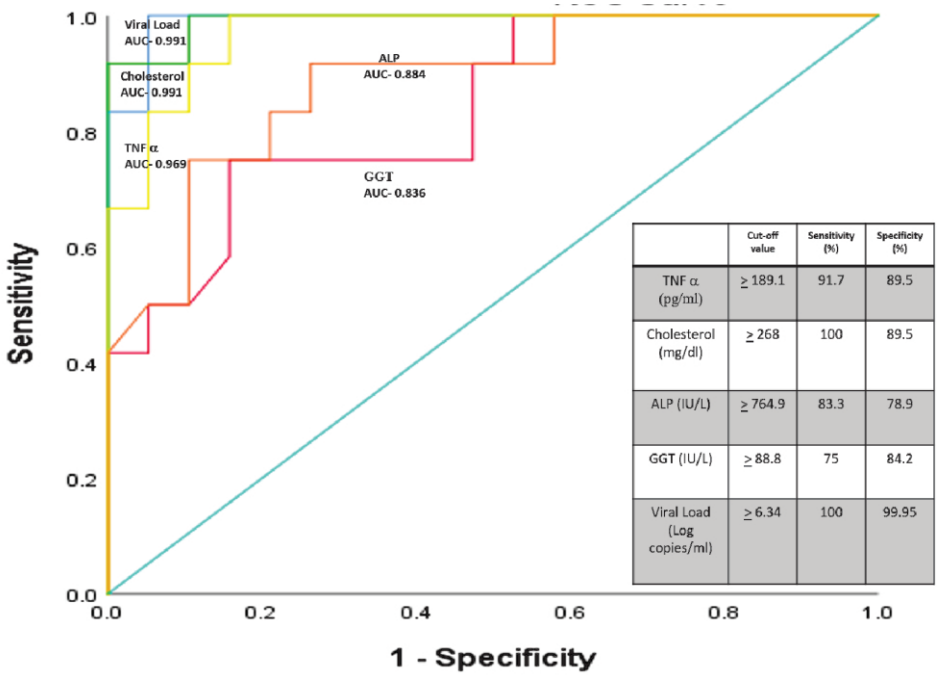
Outcome of the project:
The purpose of this study was to explore and identify naturally occurring medicinal mushrooms with significant anti-cytomegaloviral properties. We collected and isolated extracts from four different edible mushroom species and used them on in vitro cultured MRC5 and 1B4 cell lines. Cytotoxicity and anti-viral response for each mushroom was tested in a dose dependent and time dependent fashion. In our previous study we have found that among the four mushroom types, only *Pleurotus sp*. and *Lentinus sp.* have potent antiviral response with minimum cytotoxicity against human cytomegalovirus. Their crude extracts showed 100% inhibition of HCMV replication at 180 µg/ml and 160 µg/ml respectively.
The crude extract of *Pleurotus* sp. mushroom was compared with *Lentinus* sp. crude extract. Time dependent EC50 data clearly indicate that *Pleurotus sp.*and *Lentinus sp*. strongly reduced viral load (70-72%) in comparison to standard drug ganciclovir (50-55%).
After the preliminary understanding of antiviral resoponses, both these mushrooms crude extracts were subjected to chemical fractionation by different polar and non-polar solvents. Column chromatographic separation of non-polar solvent mixture of methanol: Hexane: Ethyl acetate (2:4:3) showed promising antiviral responses in Pleurotus sp. Extract. Quantification of viral load using HCMV glycoprotein H gene as reference gave log viral copy number of 6.12, 1.37 and 2.55 for untreated, treated with *Pleurotus sp.* and treated with *Lentinus sp*. extract respectively in MRC5 cell line which clearly represented that methanol: Hexane: Ethyl acetate fraction had the most promsing bioactive antiviral molecules. For track down the exact compound we have planned to do GCMS for further analysis.
Further study was targeted on a specific enzyme which is present on both these mushrooms in major quantity to search for potential antiviral activity. For this purpose bioinformatics approaches had been initiated to check if our selective mushroom protein is interacting with any immediate early or late response proteins of HCMV. For this study we have used different molecular docking predicting software. This study is still continuing.

Understanding the clinical significance of HCMV induced hepatic cholestasis in neonates and formulating relevant strategy for diagnosis

Objective:
By analysing the different associated demographic, physiological and immunological parameters we tried to formulate a more advanced defining criterion for predicting and monitoring cases of HCMV associated intrahepatic and extrahepatic cholestasis among neonates thereby generating a better therapeutic advantage. Simultaneously we also intended to decipher the pattern of variability in the phylogenetic lineage of the HCMV clinical strains inducing intrahepatic and extrahepatic cholestasis with respect to two specific HCMV glycoprotein genes.

Outcome of the study:
The neonatal patients selected for the study were classified into four independent groups based on the presence of hepatic cholestasis and active HCMV infection. ANOVA and Multivariate logistic regression were used with HCMV DNA PCR seropositive and seronegative groups both demonstrating a common clinical etiology, as dependent variable and all other factors as independent variables. Expressions of various secretory cytokines like TNF α, IFNγ, IL10 and IL6, etc. along with chemokines like MCP1, MIP1α etc. were assessed using ELISA by commercially available kits and real time quantitative PCR. The patterns of expression were correlated with different clinical parameters to assert significance in relation to a particular clinical phase and manifestations of HCMV infectivity. Our analysis predicted that total Cholesterol, GGT, ALP and TNFα were the only significant biological markers with exact cut-off scores, capable of distinguishing between HCMV associated intrahepatic and extrahepatic cholestasis (Fig 37). We confirmed that in patients belonging to both of these groups, the inflammasome complex is activated and the extent of this activation is more or less same except for the initial activators NLRP3 and AIM2 respectively (Fig 38). When we performed two separate phylogenetic analyses with HCMV gM and gN gene sequences, we found that in both cases the sequences from the IHC and EHC groups formed almost separate phylogenetic clusters (Fig 39). Our study has shown that the HCMV clinical strains infecting at intrahepatic and extrahepatic sites are phylogenetically segregated as distinct clusters. These two separate groups show different physiological as well as immunological modulations while

infecting a similar host. Our results from the phylogenetic analyses suggests that in a similar selection environment i.e. within or outside the liver, with a more or less constant selective pressure acting on them the strains are diverging similarly and hence the strains belonging to a particular group cluster together distinct from the strains belonging to the other group.



	Cut-off value	Sensitivity (%)	Specificity (%)
TNF α (pg/ml)	≥ 189.1	91.7	89.5
Cholesterol (mg/dl)	≥ 268	100	89.5
ALP (IU/L)	≥ 764.9	83.3	78.9
GGT (IU/L)	≥ 88.8	75	84.2
Viral Load (Log copies/ml)	≥ 6.34	100	99.95

Fig 37: ROC curves for the significant biomarkers defining HCMV associated IHC and HCMV blood viral load with best predictive accuracy (Area under the Curve > 0.8).

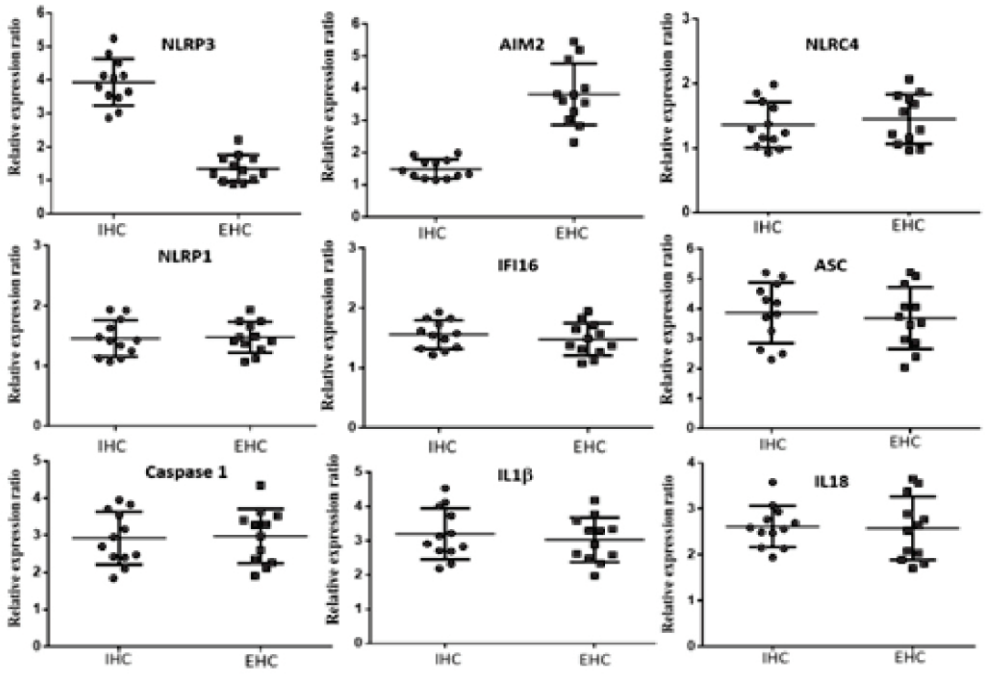


Fig 38: Differential mRNA expression of inflammasome pathway components in PBMCs from patients belonging to group 1 with either intrahepatic or extrahepatic cholestasis (N = 12). Their relative mRNA expression ratio with respect to group 4 (control group) in terms of fold change ($2^{-\Delta\Delta Ct}$) were estimated by quantitative real time PCR. GAPDH mRNA served as internal control. (+ 1 was considered to be the baseline of control, with values greater than 1 suggesting positive fold change and values below 1 upto 0 as negative fold change).

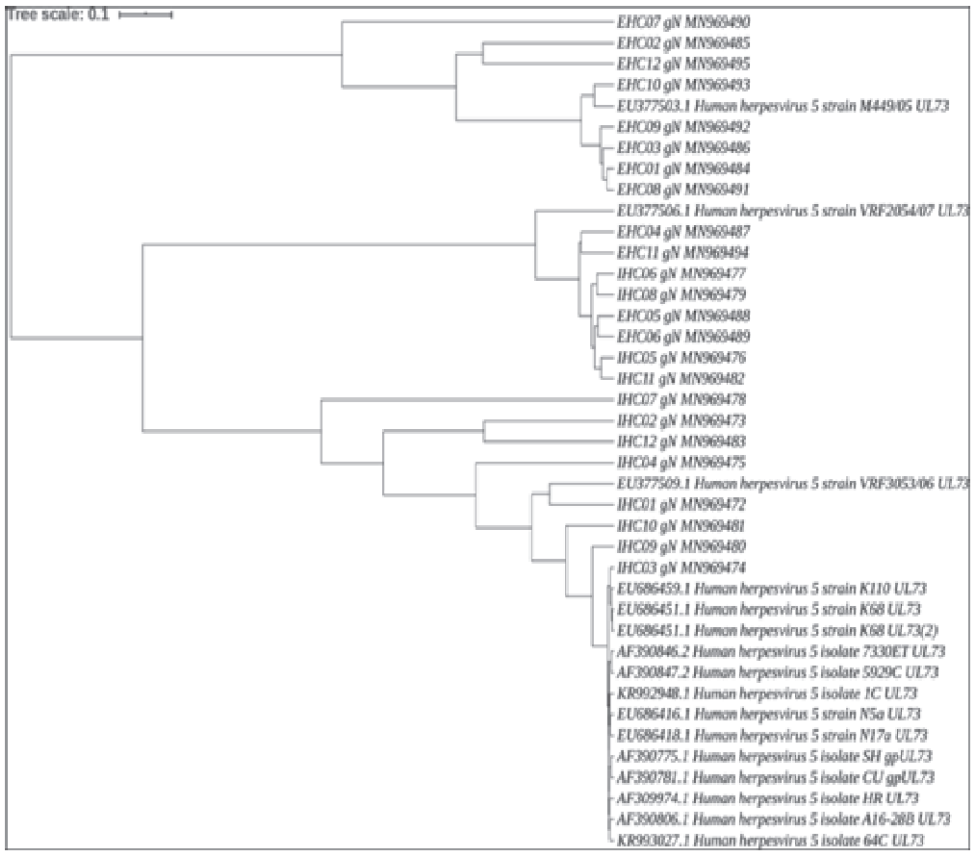


Fig 39: Phylogenetic analysis of the partially sequenced HCMV gN gene from 24 clinical samples belonging to group 1 (12 IHC and 12 EHC samples) along with 16 standard reference gN gene sequences selected from NCBI database.

Post and Pre-Doctoral Fellows

Pre-Doctoral Fellow
Mr. Sabbir Ansari, SRF-UGC
Mr. Aroni Chatterjee, SRF-UGC
Mr. Rajendra Prasad Chatterjee, SRF-DBT
Mr. Debsopan Roy, SRF-WBDST

P. C. Sadhukhan (Principal Investigator), ICMR-NICED Virus Laboratory

Genomic variation of hepatitis C virus in high risk group population in Eastern part of India

Principal Investigator: Provash C. Sadhukhan
Co-Investigator: Shanta Dutta, Souvik Ghosh, Ashokananda Konar, Maitreyee Bhattacharyya, Prasanta Chaudhary

Hepatitis C virus is a blood borne viral infection and one of the leading causes of chronic liver diseases including hepatocellular carcinoma worldwide. Like other RNA viruses, HCV exploits all mechanisms to immune escape including genomic evolution which leads to evolve new genotypes (GT) and subtypes variants. Genomic diversity of HCV among high risk group populations is common. During this Covid-19 pandemic situation, a total of 154 HCV sero-reactive blood samples were processed among them 51 (33.11%) were HCV RNA positive, of which 37 were successfully genotyped. The most prevalent genotype was GT 3a (32.43%) followed by 1c (29.72%). Rare genotypes such as 4a (8.10%) and 3i (5.40%) were also found in this region. Interestingly, most of the 3a and 1c strains were isolated from thalassemia and chronic kidney disease patients respectively.

Direct acting antivirals (DAAs) are currently used for HCV treatment. But the major obstacle for DAAs treatment is to develop HCV drug resistance variant like other RNA viruses. Due to COVID-19 pandemic, a total of 124 HCV patients were follow up with DAAs treatment, among them 8 (6.45%) patients failed to respond against treatment. Out of 8 treatment non-responders, 7 (~88%) were belonged to genotype 3 and one was genotype 1. Among the treatment failure, 6 (75%) patients were treated with sofosbuvir and daclatasvir combination and 2 (25%) individuals were found to be non-responsive against sofosbuvir and velpatasbir. Comparative analysis indicates that HCV drug resistance is more common within genotype 3 than genotype 1 in this region.

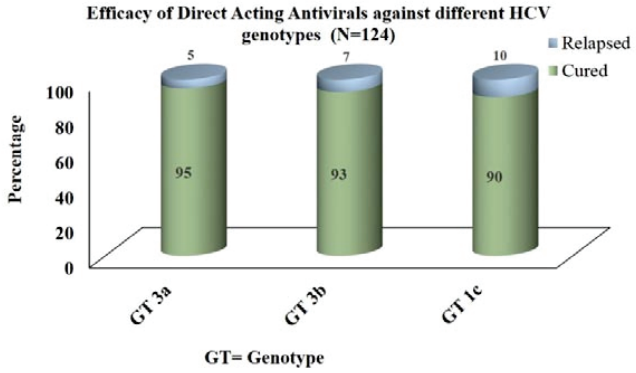


Fig 40: Efficacy of Direct Acting Antivirals against different HCV genotypes

Circulating Dengue Serotypes during Covid-19 outbreak in Kolkata and its suburbs

Investigators: Provash C. Sadhukhan and Shanta Dutta

Dengue fever, an acute systemic arboviral and neglected tropical disease, tackled more negligence in the COVID-19 pandemic in 2020. In West Bengal, number of dengue reported cases reduced to its half in comparison to other years during COVID-19 pandemic in 2020. Also, subsequent lockdowns, unavailability of transport and COVID-19 fear caused low access to dengue samples. With all these hindrances, we have collected/received 469 dengue NS1 sero-positive but COVID-19 negative samples from Kolkata and its suburbs in the year 2020. NS1 positive samples were subjected to molecular serotyping to obtain the circulating DENV serotypes. Out of 469 seropositive samples, 446 samples were processed for viral RNA extraction and serotyping. Among them, 71.97% (n=321) were RNA positive. RNA positive samples were further processed for serotyping, it was found that 46.73% (n=150) were DENV4 and the prevalent serotype followed by 33.96% (n=109) DENV2, 12.15% (n=39) DENV3 and 7.16% (n=23) of DENV1. Dengue fever and COVID -19 infection is hard to differentiate at the initial stage, as they share the similar spectrum of symptoms. There were also reports of false NS1 sero-positive results among Covid-19 patients, this may be due to NS1 cross-reactivity of dengue and COVID-19. Rapid change in pattern of circulating serotypes was observed from year 2019 to 2020. In 2019, DENV2 was the prevalent circulating strain whereas DENV4 was in 2020 (Fig 41). Considering the consequences of secondary dengue infection, dengue molecular serotyping is much needed especially in tropical and subtropical countries for better clinical management of dengue patients.

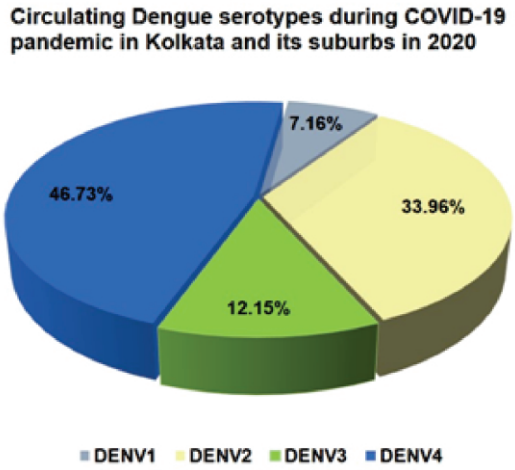


Fig 41: Circulating dengue serotypes during COVID-19 pandemic in Kolkata and its suburbs in 2020

List of Conferences / Seminars /Workshops / Meetings / Trainings Attended / Organised

Attended in Virtual Mode

- Attended Virtual Genetic Solutions Tour 2020. [Asia-Pacific and Japan (APJ)]. **1-2 July, 2020**.
- Attended European Society for pediatric infectious diseases. **26-29 October, 2020**.
- Attended 12th Annual meeting of Proteomics Society, India (PSI), International virtual symposium on 'Integrated Omics Approaches in Health and Agriculture'. Organized by CSIR-National Chemical Laboratory, Pune. **22 - 24 November, 2020**.
- Attended Viral Hepatitis and COVID 19 update program. **1st December, 2020**.
- Attended 27th Annual Scientific Meeting of Indian National Association for study of the Liver (INASL):6:00PM - 9:00 PM (IST)**. 2-4 December, 2020.**
- Attended Communicable Diseases & Innovative Public Health Interventions. Organised by ICMR-National AIDS Research Institute, Pune, India. **12th December, 2020**.
- Attended India International Science Festival - 2020 - Science for Self-Reliant India and Global Welfare. Organised by CSIR-National Institute of Science, Technology and Development Studies. **22-25 December, 2020.**
- Attended seminar on: The Challenges for STI: Learning Lessons from the Pandemic". the theme for the National Science Day of this year "Future of STI: Impacts of Education, Skills and Work". **26th February, 2021**.

Post and Pre-doctoral Fellows

Post-Doctoral fellow:
Dr. Ronita De, ICMR Research Associate III
Dr. Promisree Choudhury (Project Research Scientist)
Dr Kamalika Roy Choudhury (Project Research Associate II)
Dr. Moumita Mazumdar (Project Research Scientist)

Pre-Doctoral fellow:
Mr. Supradip Dutta, SRF-UGC
Ms. Upasana Baskey, SRF-UGC
Ms. Priya Verma, SRF-UGC
Mr. Sagnik Bakshi, JRF-Project
Ms. Raina Das, JRF-Project

SERVICES PROVIDED BY THE INSTITUTE

Quality Assurance for HIV Testing

External Quality Assurance Scheme is one of the important tools to assess the performance of the laboratory and their ability to generate accurate results. National Reference Laboratory of ICMR-NICED is the proficiency testing provider for HIV antibody testing for the States Reference Labs (SRLs) of A&N, Assam, Jharkhand, Meghalaya, Mizoram and Orissa (Figure:)
Referral Services: National Reference Lab, NICED has been entrusted with the responsibility of verifying results for samples sent by Hospitals. Samples tested, result communicated within the turnaround time, analysed the root cause of discordance and trained the referring lab personnel for improvement and technical capacity building. Most of the samples are positive for HIV antibody indicating improvement of quality of the referring labs.

Table 1: Referral Service done for the institutions at NACO NRL, ICMR-NICED, Kolkata.

Sl. No.	Source of Samples	No. of sample Tested	No. of sample Positive
1.	Command Hospital (EC), Kolkata	11	11

Table 2 : HIV Sentinel Surveillance 2021 (ANC and Prison): NRL, ICMR-NICED (Testing Lab.), Kolkata (sample received from January 2021 to March 2021).

State	Testing Centres	Samples sent by SRL				Samples	Confirmed Result at NRL				Discordant
		All -ve	HBsAg +ve	HCV +ve	RPR +ve	Rejected at NRL	All -ve	HBsAg +ve	HCV +ve	RPR +ve	
Jharkhand	SRL-Regional Institute of Medical Sciences, Ranchi, Jharkhand	27	Nil	2	Nil	Nil	27	Nil	2	Nil	Nil
	SRL-SNM Medical College, Dhanbad, Jharkhand	24	2	1	Nil	Nil	24	2	1	Nil	Nil
	SRL-MGM Medical College, Jamshedpur, Jharkhand	16	Nil	1	Nil	Nil	16	Nil	1	Nil	Nil

Table 3:HIV Sentinel Surveillance 2021 (ANC): Inter Lab Comparison for SRLs under NRL, ICMR-NICED, Kolkata (sample received from January 2021 to March 2021)

Name of the site (Type)	Site code with subsite	Samples received	Samples rejected	Samples tested	Result (Reactive)			
					HIV	Hep B	Hep C	RPR
Abinash Dutta Maternity Home (ANC)	19335012-0	304	Nil	304	01	02	Nil	Nil
Jangipur Sub-Divisional Hospital (ANC)	19325021-0	346	06	340	Nil	03	Nil	01
Nabadwip State General Hospital (ANC)	19328011-0	240	Nil	240	Nil	01	Nil	Nil
Vidyasagar State General Hospital (ANC)	19335021-0	286	03	283	Nil	Nil	Nil	01
Aranghata BPHC (ANC)	19328012-1	148	01	147	Nil	04	Nil	Nil
Ranaghat Sub-Divisional Hospital (ANC)	19328012-2	200	Nil	200	Nil	05	Nil	Nil
Madhyamgram Rural Hospital (ANC)	19329021-1	137	Nil	137	Nil	01	Nil	Nil
Barasat District Hospital (ANC)	19329021-2	157	Nil	157	Nil	Nil	Nil	Nil
Berhampore Central Correctional Home (Prison)	19325131-0	182	Nil	182	01	05	01	01

Table 4 : HIV Sentinel Surveillance 2021 (DBS for HRG): NRL, ICMR-NICED (Testing Lab.), Kolkata (sample received from January 2021 to March 2021).

SL. No	Name of site	Site type	STATE	Site code	Samples with subsite	Samples received	Tested rejected	Tested HIV (+ve)
1	Chetna Child & Women Welfare Society	FSW	Chhattisgarh	22253041-0	242	NIL	242	04
2	Samarpit	FSW		22245043-0	141	1	140	04
3	Chetna Child & Women Welfare Society	FSW		22249041-0	NIL	NIL	NIL	NIL
4	Jankalyan Samajik Sansthan	FSW		22247041-0	184	NIL	184	04
5	AsthaSamiti (New 21)	FSW		22246071-0	137	10	127	00
6	Vikas Evam Anusandhan Sansthan	MSM		22248051-0	95	NIL	95	04
7	Samman Sankalp Samiti	MSM		22245051-0	161	NIL	161	15
8	Chhattisgarh Prachar EvamVikas Sansthan	IDU		22245061-0	173	NIL	173	34
9	Path Pradarshak	IDU		22675061-0	138	1	137	05
10	Adarsh Navyuak Mandal	IDU		22243061-0	158	NIL	158	02
11	Pahal	LDT		22249081-0	126	NIL	126	04
12	Bastar Samajik Jan Vikas Samiti (BSJVS) (New 21)	LDT		22253081-0	86	5	81	01
13	Nischay Samiti	SMM		22242071-0	143	NIL	143	02

SL. No	Name of site	Site type	STATE	Site code	Samples with subsite	Samples received	Tested rejected	Tested HIV (+ve)
14	Vikas Anusandhan Samiti (New 21)	H/TG	Chhattisgarh	22248091-1	77	NIL	77	NIL
15	Shree Balaji Medical Foundation	H/TG		22248091-2	50	NIL	50	04
16	Samman Sankal Samiti	H/TG		22248091-3	51	NIL	51	13
17	Manbha Foundation (Lam Jingshai)	FSW	Meghalaya	17437041-0	00	NIL		00
18	MCSWA Jowai (New 21)	FSW		17696041-0	NIL	NIL	NIL	NIL
19	KJP SELDA Nongpoh (New 21)	FSW		17436041-0	NIL	NIL	NIL	NIL
20	Adil Gandhian Society (New 21)	FSW		17434041-0	NIL	NIL	NIL	NIL
21	Lam Jingshai (New 21)	MSM		17427051-0	NIL	NIL	NIL	NIL
22	Manbha Foundation	IDU		17437062-1	NIL	NIL	NIL	NIL
23	VHAM-Shillong	IDU		17437062-2	NIL	NIL	NIL	NIL
24	MCSWA-Jowai	IDU		17696061-0	NIL	NIL	NIL	NIL
25	VOLCOMH	FSW	Mizoram	15422042-0	110	NIL	110	66
26	AMRO	IDU		15421061-0	188	03	185	95
27	CAPD	IDU		15423061-0	119	NIL	119	57
28	WADA	IDU		15425061-0	116	NIL	116	24
29	SHALOM	IDU		15422061-0	211	NIL	211	114
30	CODNERC	IDU		15424062-1	130	NIL	130	70
31	ZEP, Serchip	IDU		15424062-2	73	NIL	73	20
32	Samaritan Society of Mizoram (SSM) Aizawl	SMM		15422071-0	215	NIL	215	06
33	Bethany Welfare Society	IDU		15420061-1	109	03	106	32
34	Nexus, Phaileng	IDU		15420061-2	85	NIL	85	04
35	Zoram Driver Ramthim Board (ZDRB)	MSM		15422051-0	144	NIL	144	21
36	Social Guidance Agency (SGA)	IDU		15422062-0	167	NIL	167	56
37	Akimbo Society, Dimapur	FSW	Nagaland	13408041-1	59	NIL	59	03
38	Prodigals Home, Dimapur	FSW		13408041-2	60	NIL	60	01
39	Guardian Angel, Dimapur (New10)	MSM		13408051-0	NIL	NIL	NIL	NIL
40	Guardian Angel, Mokokchung (New21)	MSM		13405051-0	53	NIL	53	01
41	Dimapur Civil Hospital / Bethesda Dimapur	IDU		13408061-0	97	1	96	02
42	Kirpa Kohima	IDU		13409061-0	106	NIL	106	05
43	NEDHIV Mokokchung / Tuli, NEDHIV	IDU		13405061-1	NIL	NIL	NIL	NIL
44	Care Counselling Center, Mokokchung	IDU		13405061-2	75	NIL	75	01
45	Grace Society, Changtongya	IDU		13405061-3	51	NIL	51	NIL

SL. No	Name of site	Site type	STATE	Site code	Samples with subsite	Samples received	Tested rejected	Tested HIV (+ve)
46	Shansham_Mon / Mon_Civil Hospital	IDU	Nagaland	13403061-1	79	NIL	79	NIL
47	Turning Point Tizit	IDU		13403061-2	53	1	52	01
48	Nagaland Network Aboi CC	IDU		13403061-3	NIL	NIL	NIL	NIL
49	Eureka_Phek/ Bethesda_Phek	IDU		13410061-1	140	NIL	140	NIL
50	Lightway Phek	IDU		13410061-2	100	NIL	100	04
51	IDS, Tuensang	IDU		13404061-0	187	NIL	187	12
52	Network Wokha	IDU		13407061-1	59	NIL	59	00
53	Bethesda Youth IDU	IDU		13407061-2	53	NIL	53	01
54	Zion Welfare IDU	IDU		13407061-3	NIL	NIL	NIL	NIL
55	Salvatus_Zunheboto / Civil Hospital, Zunheboto	IDU		13406061-1	51	NIL	51	03
56	Akimbo, Akuluto	IDU		13406061-2	50	NIL	50	NIL
57	Tribal Farmer Asso / Cultural Club (New17)	IDU		13613061-1	117	11	106	02
58	Cultural Club Athibung IDU	IDU		13613061-2	69	NIL	69	01
59	IBAPWO Kiphire CC	IDU		13401061-0	41	NIL	41	NIL
60	Yingli Mission Society Tamlu (New 21)	IDU		13601061-0	174	NIL	174	NIL
61	NEDHIV Trucker TI (New17)	LDT		13408081-0	174	NIL	174	02
62	Humbai Club	FSW		16428041-0	49	NIL	49	01
63	Village Development Team	FSW		16428041-2	66	NIL	66	NIL
64	Dishari	FSW		16429041-1	61	NIL	61	NIL
65	VSDO	FSW	Tripura	16429041-2	34	NIL	34	NIL
66	Sanghadeep	FSW		16431041-1	68	NIL	68	NIL
67	Teressa Welfare Society	FSW		16431041-2	49	NIL	49	07
68	Prabaha Dhalai	FSW		16430041-0	100	NIL	100	04
69	Kumarghat Rural Hospital	IDU		16647061-0	100	NIL	100	24

Proficiency testing program for NRLs conducted by Apex Lab (NARI, Pune): NACO-National Reference Laboratory of ICMR-NICED participated in the proficiency testing program conducted by Apex Laboratory, ICMR-NARI, Pune twice in a year.

Proficiency testing program for SRLs and their attached ICTCs: NACO- National Reference Laboratory of ICMR-NICED conducted "Proficiency Testing Programme" for 12 State Reference Laboratory and their attached ICTCs. Collection of samples, preparation, characterization and validation of panel is the steps to be followed for whole activity.

Diagnostic Kit Evaluation by Consortium of NRLs at ICMR-NICED

The evaluation of diagnostic kits for transfusion transmitted infections, before using in field, is an important aspect of obtaining good quality kits.In this direction, a robust mechanism has been developed by Consortium of National Reference Labs following the uniform procedure countrywide to evaluate performance of commercial kits. Being a member of Consortium labs, ICMR-NICED is engaged in Quality assurance of HIV, HBV & HCV diagnostic kit which is routed through Consortium secretariat, ICMR-NARI, Pune.

Table 5: Kit Evaluation by Consortium of NRLs, ICMR-NICED, Kolkata

Type of Kit Evaluated	No. of Kit / Batch Received	No. of Kit / Batch accepted and Evaluated	No. of Batches meet the required Sensitivity	No. of Batches meet the required Specificity	Total no. of batches complying with specification of CDSCO
HIV ELISA	12	12	12	12	12
HIV RAPID	05	05	05	05	05
HBsAg ELISA	12	12	12	12	12
HBsAg RAPID	00	NA	NA	NA	NA
HCV ELISA	12	12	12	12	12
HCV RAPID	04	04	01	04	01
TOTAL	45	45	42	45	42

Integrated Counseling & Testing Centre (ICTC)

Integrated Counselling & Testing Centre (ICTC), currently known as HIV Counselling and Testing Services (HCTS) is key entry point to prevention, treatment and care of HIV and related infections. It continues to envisage the provision of comprehensive services in an integrated manner. HCTS comprises of counselling (pre-test counselling, informed consent and post-test counselling); testing and prompt delivery of test results with embedded quality assurance; ensuring audio-visual privacy and confidentiality; also linkages to appropriate HIV prevention, care, support and treatment services after meticulously following "5Cs" viz. Consent, Confidentiality, Counselling, Correct test results and Connection.

The main functions of the ICTC include:

- Conducting HIV diagnostic test.
- Conducting VDRL test to High Risk Groups (HRG).
- Conducting HbsAg, HCV tests when required.
- Providing basic information on modes of transmission and prevention to promote healthy behavioral change and reduce vulnerability.
- Providing psycho-social support to HIV positive clients.
- Link HIV positive clients with other HIV prevention, care treatment services.
- Providing risk reduction counseling to clients who found HIV negative.
- Follow-up counseling and testing.
- PEP distribution if required.
- Free condom distribution.
- Cross referrals to NTEP, STI, ART, TI-NGOs etc.
- Participated in outreach activities to monitor Community Based Screening (CBS).
- Participated in discussion on HIV screening, HIV confirmation and target group for screening of CSC staff as resource person.

ICTC activities

Table 6 : HIV testing details at ICTC, ICMR-NICED (April 2020- March 2021)

Total Tested	Positive	Positivity	HIV-TB Co-Infection	Client initiated Tested	Provider Initiated Tested
264	9	3.40%	2	114	150

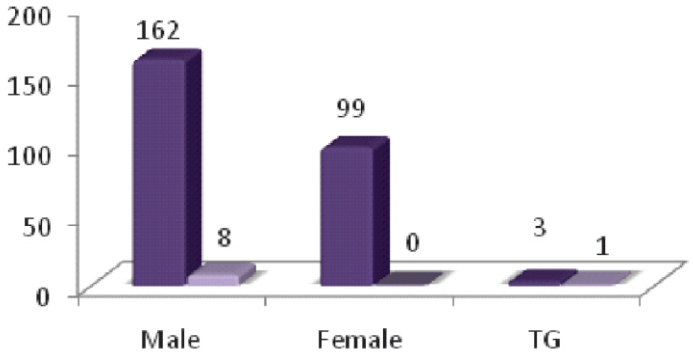


Table7 : HBSAG, HCV, VDRL testing details in ICTC, ICMR-NICED (April 2020-March 2021)

Tests	HbsAg	HCV	VDRL
Total Tested	118	116	13
Total Positive	1	1	1

A high standard of testing is maintained at ICTC by using 3 test principles for diagnosing HIV. ICMR-NICED ICTC secured 100% concordance result in external quality assurance scheme (EQAS) through State Reference Laboratory. From April 2020 to March 2021 total 264 clients were tested for HIV in ICTC. Among them 9 were found positive. HIV positive clients were linked to ART centre, STI clinic and NTEP for further treatment and care. HIV negative clients were also linked to STI centre and NTEP if required.

Plasma Viral Load Assay of HIV

HIV Viral load assay under NACO, is being conducted at ICMR-NICED – Molecular HIV Laboratory, for ensuring efficacy of ART and taking evidence-based decision for initiation of further treatment. Quantitative measurement of HIV level in peripheral blood has greatly contributed to the understanding of the pathogenesis of HIV infection and has been shown to be an essential parameter in prognosis and management of HIV infected individuals. Decisions regarding initiation or changes in antiretroviral therapy are guided by monitoring plasma HIV RNA levels (viral load). The goal of antiretroviral therapy is to reduce the HIV virus in plasma to below detectable levels (below 1000 copies/ml of plasma which corresponds to a viral suppression and efficacy of the antiretroviral therapy). ICMR-NICED is one of the Laboratories under NACO that uses Abbott RealTime HIV-1 RNA assay, which is an in vitro reverse transcription polymerase chain reaction (RT-PCR) assay for the quantization of HIV-1 in human plasma. ICMR-NICED Molecular HIV laboratory restarted HIV viral load assay for the patients under ART for monitoring effectiveness of on-going treatment as per national guidelines and also to assist in HIV drug resistance mutation assay.
Presently, there is one linked center in West Bengal sending specimens to ICMR-NICED for HIV Viral Load test. For the period of April 1st 2020 to March 31st, 2021, **2718** Viral Load samples were received at ICMR-NICED, and a total of **2431** samples were tested for HIV viral load during the particular period.

Table 8: Status of HIV Viral Load Assay for patients under ART for the period of April 1st 2020 to March 31st, 2021

No. of Samples		HIV-1 Viral Load Copy No. <1000	HIV-1 Viral Load Copy No.>1000	HIV-1 Viral Load TARGET NOT
Received	Tested	copies / ml of plasma	copies / ml of plasma	DETECTED (TND)
2718	2431	248	195	1988

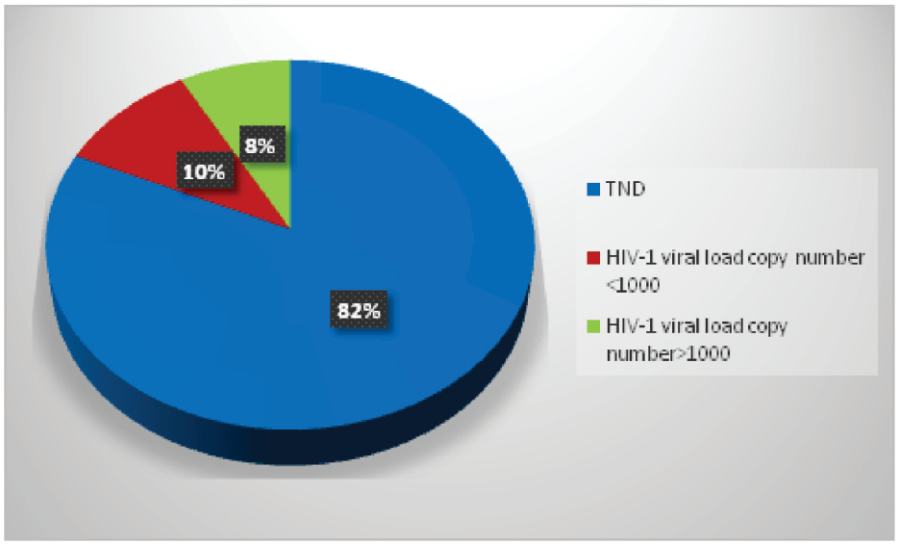


Fig2 : Distribution of PLHIV (as percentage of total sample tested) having ART according to their Viral Load values (Period: April 1st, 2020 to March 31st, 2021)

Regional Institute for HIV Surveillance

The activity of Regional Institute (East), ICMR-NICED, involves implementation of HIV Sentinel Surveillance (HSS) among Antenatal Clinic (ANC) attendees and High Risk Group (HRG) for the East and North Eastern states with the aims to monitor the (i) trends and prevalence of HIV infection, (ii) distribution and spread of HIV prevalence in different population subgroups and in different geographical areas (iii) to identify emerging pockets of HIV epidemic in the country and (iv) to generate data for HIV estimations and projections. RI (E) also has an important role in data entry and data management of HSS.

Major Activities of Regional Institute:

- Technical support & guidance to State AIDS Control Societies SACS in overall planning & implementation of HSS activities in eastern Indian states, facilitating smooth implementation of HSS activities by liaisoning with the concerned state authorities and addressing specific problems at sentinel sites/ testing laboratories.
- Technical Validation & approval of new sites through review of relevant data & site visits.
- Conduction of Regional Pre & Post-surveillance co-ordination & planning meetings, Regional Trainings and Workshops for HIV Surveillance.
- Technical & Supervisory support for state level training of site personnel & lab personnel.
- Monitoring & Supervision during HSS through site visits by RI team members.
- Constitution of State Surveillance Teams (SST) and coordination of all their activities including Monitoring & Supervision by SST members.
- Ensuring timely reporting & corrective action at sites/testing labs during the round.
- Data Entry, matching, modifying, freezing & cleaning through SIMS.
- Concurrent data monitoring and initiation of corrective action, as required.
- Guide SACS in preparation of state surveillance reports after the round.
- Undertaking special epidemiological or operational studies and in-depth analyses during the inter-surveillance period to validate or strengthen surveillance findings.
- Technical review and approval of any other specific proposal from SACS related to HSS.
- Submission of report of activities undertaken during surveillance and analysis of the surveillance findings in the allocated states.
- From 2019, HSS Plus is being initiated at 50 central prisons to monitor the level and trends of HIV prevalence and related risk behaviours over time among the inmates of central prison.
- The BSS-Lite was implemented during 2019-20 with an objective to estimate the prevalence of HIV related risk and safe behaviors, knowledge, attitude and practices and service uptake among key population groups.
- HSS Plus 2020-21 was implemented among all typologies (ANC, HRG, Bridge populations and Prison inmates)

Table 9 : ANC Sites in ICMR-NICED region for HSS Plus 2020-21:

States	No. of Sites	Samples Allotted	No. of Testing lab
Andaman & Nicobar Islands	4	1600	1
Chhattisgarh	28	11200	3
Meghalaya	12	4800	2
Nagaland	13	5200	2
Sikkim	5	2000	1
West Bengal	25	10000	4

Table 10: HRG/Bridge Population Sites in ICMR-NICED region for HSS Plus 2020-21

States	No. of Sites	Samples Allotted	Testing Lab	
			HIV	**Hep-B &Hep-C***
Chhattisgarh	14	3500	NRL, ICMR-NICED	Viral Hepatitis Lab, ICMR-NARI
Meghalaya	7	1750	NRL, ICMR-NICED	Viral Hepatitis Lab, ICMR-NARI
Nagaland	15	3750	NRL, ICMR-NICED	Viral Hepatitis Lab, ICMR-NARI
Sikkim	3	750	NRL, STM	Viral Hepatitis Lab, ICMR-NARI
West Bengal	18	4500	NRL, STM	Viral Hepatitis Lab, ICMR-NARI

*Besides HIV, other two biomarkers (Hepatitis & B Hepatitis C) are also tested for all the specimen during HSS 2021.

Table 11 : Typology-wise HRG Sites in ICMR-NICED region for HSS Plus 2021:

States	FSW	MSM	IDU	TG	LDT	SMM
Andaman & Nicobar Islands	0	0	0	0	0	0
Chhattisgarh	5	2	3	1	2	1
Meghalaya	4	1	2	0	0	0
Nagaland	1	2	11	0	1	0
Sikkim	1	0	2	0	0	0
West Bengal	6	4	2	2	3	1

Table 12 : Prison Sites in ICMR-NICED region for HSS Plus 2020-21

States	No. of Sites	Samples Allotted
Chhattisgarh	2	800
Nagaland	1	400
West Bengal	3	1200

Major achievements

- Regional Institute (East), ICMR-NICED implemented HIV Sentinel Surveillance (HSS) among Antenatal Clinic (ANC) attendees, High Risk Group (HRG) and Prison Inmates for the East and North Eastern states.
- RI (E) also implemented Behavioral Surveillance Survey-Lite among HRGs in the staes of Nagaland and West Bengal.
- Provide assistance in preparation of Estimation Report for the states in ICMR-NICED region.
- Provide technical support on development of operational manuals for site personnel, Lab manual, data forms and informed consent forms for the HSS Plus

- Provided technical support & guidance to State AIDS Control Societies (SACS) in overall planning & implementation of HSS activities in East and North Eastern statesGuide SACS and NACO in preparation of state surveillance reports after the round.
- RI (E), ICMR-NICED was responsible for understanding the drivers of HIV Epidemics in the states of Mizoram, Manipur, Nagaland, Meghalaya, Assam and Tripura.
- National AIDS Control Organisation (NACO) commissioned a study to evaluate Impact of Antiretroviral Therapy under the National AIDS Control Programme in India (ART-IE India). ICMR-NICED implemented the ART-IE study in North-East (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim) and Eastern states (Bihar, Odisha and West Bengal). Aims of ART-IE study were to assess effectiveness / impact of ART components and also its attribution to overall NACP Goals.

Training for HSS at Kohima, Nagaland

Participants at 'Data analysis workshop for Epidemiological Investigations study'

Early Infant Diagnosis (EID)

Molecular diagnosis of HIV among babies (up to 18 months) born to HIV infected mothers is being done at ICMR-NICED Regional Reference Lab (RRL), using Dried Blood Spot (DBS) samples, employing state-of-art molecular assay for 14 states of East and North-Eastern India. The aim of this National Program is to ensure early initiation of ART for the infected babies and also to monitor effectiveness of current practice of PPTCT (Prevention of Parent To Child Transmission).

NACO-conducted EID Program is the cornerstone in the efforts to significantly reduce HIV related morbidity and mortality in infants. The diagnosis of HIV infection in infants and children younger than 18 months is different from that in adults due to trans-placental transfer of maternal antibodies from mother to child during pregnancy, childbirth and breast feeding. Hence, HIV-1 TNA (Total Nucleic Acid) PCR testing is recommended for the babies less than 18 months of age.ICMR-National Institute of Cholera and Enteric Diseases (NICED) is one of the 6 Regional Reference Laboratories (RRL) among AIIMS, ICMR-NICED, NITR, MUniv, NIMHANS & NARI, under NACO, performing RealTime HIV-1 Qualitative in vitro amplification assay for the qualitative detection of Human Immunodeficiency Virus Type 1 (HIV-1) nucleic acids from Dried Blood Spot (DBS) samples. In ICMR-NICED, EID program has been

started from August, 2010 initially with three states, West Bengal, Orissa and Chhattisgarh. With gradual success of the program, the North Eastern states (Jharkhand, Bihar, Assam, Manipur, Mizoram, Nagaland, Meghalaya, Arunachal Pradesh, Sikkim, Tripura, and Andaman & Nicobar Islands) were also included under ICMR-NICED-RRL (Molecular HIV Laboratory).

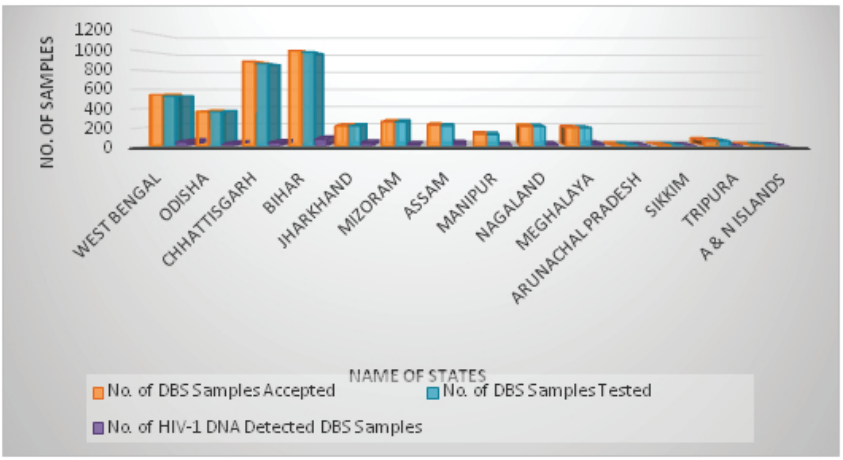
Presently, 1269 ICTCs are involved in collection of DBS samples in 14 states under NICED-RRL for DBS HIV-1 PCR. A National Testing Algorithm comprising of two sections according to the age group of the child (Algorithm A: for infants < 6 months and Algorithm B: for child 6-18 months) have been followed for HIV exposed infants in this EID program for detection of HIV-1 DNA. All DBS HIV-1 PCR reactive/detected specimens are further confirmed by a 2nd Confirmatory HIV-1 PCR of the same sample.

A total of **4221** DBS samples were received from April 2020 to March 2021 at ICMR-NICED-Regional Reference Laboratory (Molecular HIV Lab) and among them **4108** samples were accepted for testing, according to sample acceptance criteria. A total of **4035** DBS samples were tested for the period of 01.04.2020 to 31.03.2021 (The number of samples accepted and tested in a month may not tally due to previous pending samples) and their status is depicted below.

Table 13: Status of EID DBS Sample Accepted and Tested (with Positivity of HIV-1) at ICMR-NICED from the period April 2020 to March 2021

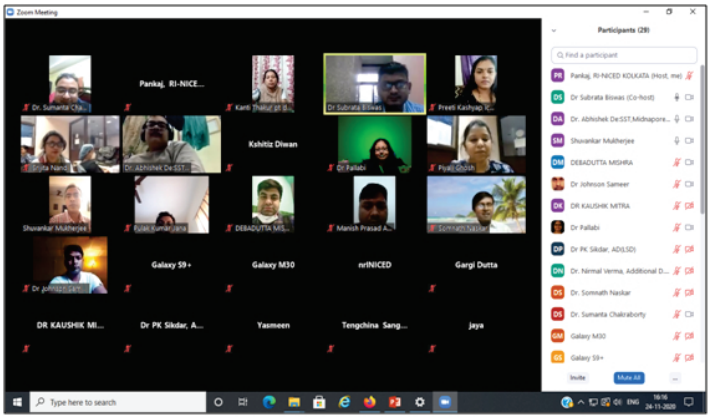
Name of States	No. of DBS Samples Accepted	No. of DBS Samples Tested	No. of HIV-1 DNA Detected DBS Samples
West Bengal	544	529	43
Odisha	365	363	22
Chhattisgarh	897	874	36
Bihar	1012	997	74
Jharkhand	215	214	29
Mizoram	257	257	12
Assam	221	215	24
Manipur	125	121	5
Nagaland	208	207	14
Meghalaya	195	193	20
Arunachal Pradesh	7	7	1
Sikkim	4	1	0
Tripura	55	54	3
A & N Islands	3	3	0
TOTAL	4108	4035	283

*(*The number of samples accepted and tested in a month MAY not tally due to previous pending samples)*



Training and Extension activities:

- One day meeting with Technical Officers & Technicians (12 State Reference Laboratories) and respective SACS officials from A & N Islands, Assam, Mizoram, Meghalaya, Jharkhand and Odisha for NACO Proyogshala updates was held on 31st July 2020 on virtual mode. Number of participants – 18
- Regional Training of Trainers for HIV Sentinel Surveillance (ANC round) for the states of Andaman & Nicobar Islands, Chhattisgarh, Meghalaya, Nagaland, Sikkim and West Bengal was organized by ICMR-NICED during 23rd – 24th November 2020 in virtual platform.Number of participants – 35
- Regional Training of Trainers for HSS Plus (HRG & Bridge populations) for the states of Chhattisgarh, Meghalaya, Nagaland, Sikkim and West Bengal was organized by ICMR-NICED during 25th – 27th November 2020 in virtual platform.Number of participants – 30



- Training of Serum Testing laboratories under HSS in ICMR-NICED Region during 18th January 2021 in virtual platform. RI project coordinator attended the training program as resource person. Number of participants –15
- Training cum workshop on Panel sera distribution and implementation of NACO Proyogshala for sate reference laboratories of six states, A & N Islands, Assam, Mizoram, Meghalaya, Jharkhand and Odisha was held virtually on 18th January 2021. Number of participants – 28
- Training on NACO Proyogshala for ICTC Lab Technicians under Jhatkhand SACS was held virtually on 20th January 2021. The training was organized by ICMR-NICED. Number of participants – 46
- Site level training of prison inmate sites for the states of Chhattisgarh, Nagaland and West Bengal during 25th January 2021 in virtual platform. RI team member and SST members attended the training program as resource person.Number of participants – 25.

Virus Research and Diagnostic Laboratory (VRDL)

Detection of SARS-CoV-2 by RT-PCR
ILQC of COVID-19 testing laboratories (RT-PCR) of West Bengal and Sikkim
Other viruses:

Pathogen/Disease	Parameter Tested	Principle of Test
Dengue	Dengue NS1 Antigen	ELISA
	Dengue IgM Antibody	
	Dengue IgG Antibody	
Chikungunya	Chikungunya IgM Antibody	ELISA
	Chikungunya viral RNA	Real Time PCR PCR
Zika	Zika viral RNA	Real Time PCR PCR
Japanese Encephalitis	Japanese encephalitis IgM Antibody	ELISA
Hepatitis	Hepatitis A virus IgM Antibody	ELISA
	Hepatitis E virus IgM Antibody	
	Anti-Hepatitis C virus Antibody	
	HBsAg	

Influenza	Influenza A viral RNA	Real Time PCR
	Influenza A - H1N1 viral RNA	
	Influenza A - H3N2 viral RNA	
	Influenza B viral RNA	
	Influenza B - Yamagata viral RNA	
	Influenza B - Victoria viral RNA	
Other Respiratory Viruses	Respiratory syncitial virus - A RNA	Real Time PCR
	Respiratory syncitial virus - B RNA	
	Human metapneumovirus - A1A2 RNA	
	Human parainfluenza virus - 1 RNA	
	Human parainfluenza virus - 2 RNA	
	Human parainfluenza virus - 3 RNA	
	Human parainfluenza virus - 4 RNA	
	Respiratory adenovirus DNA	
	Rhinovirus RNA	
Mumps	Mumps IgM Antibody	ELISA
Measles	Measles IgM Antibody	ELISA
Rubella	Rubella IgM Antibody	ELISA
	Rubella IgG Antibody	
Varicella Zoster	Varicella zoster IgM Antibody	ELISA
Cytomegalovirus	Cytomegalovirus IgM Antibody	ELISA
Enteric Viruses	Rotavirus Antigen	ELISA
	Adenovirus viral DNA	ELISA
Scrub Typhus	Scrub typhus DNA	Real Time PCR
	Scrub typhus IgM Antibody	ELISA
Leptospira	Leptospira DNA	Real Time PCR
	Leptospira IgM Antibody	ELISA

Workshops conducted:

Title	Date	Place	Organized by	Participating institute	No. of participants
Laboratory detection of SARS-CoV-2 by RT-PCR	05th Apr 2020	Regional VRDL	Regional VRDL	VRDL, Malda MC	03
	09th Apr 2020			VRDL, Murshidabad MC	03
	13th Apr 2020			Command Hospital (EC)	03
	15th Apr 2020			VRDL, R.G. Kar MC	01
	02nd Jun 2020			ESIC, Joka	03
Biosafety and Biosecurity	18th Dec 2020	NICED – II Seminar Hall	Regional VRDL	ICMR-NICED and I3T, Kolkata	52

Influenza Diagnostics :

NICED VRDL is working on Influenza surveillance among elderly to understand the status of influenza virus infection among the elderly population in India, A weekly domiciliary surveillance was conducted for assessment of Influenza A and B virus in Acute Upper RespiratoryInfection (AURI) and Acute Lower Respiratory Infection (ALRI).In this connection samples received from the community field were analyzed for the presence of influenza viruses. All the samples were typed and subtyped to evaluate the presence of influenza virus. Out of 189 samples from the community, only 2 (1.05%) samples were positive for influenza A and both samples subtyped into H3N2. Only one sample from the community was positive for RSV. Hospitals samples collection were stopped within this period due to the Covid-19 pandemic

Phage typing of *V. cholerae* O1 :

Vibrio phage Reference Laboratory of NICED is a referral laboratory which provides service to the nation on phage typing of *V.cholerae* strains. I am involved in a project entitled **"Nationwide screening of phage types of *V. cholerae* O1 and O139**". ICMR-NICED use to receive strains from different medical colleges and research institutes around the country of India for bio-typing, sero-typing and phage typing study. Due to unprecedented COVID-19 pandemic situation, regular sample arrival from different hospitals were interrupted in the year 2020-21, our center received very few samples this year which were characterized by phage typing using a panel of typing phages available with us at the Vibrio Phage Reference Laboratory.Strains received were confirmed as *V.cholerae* O1 biotype ElTor and were serotyped using the panel of antisera available with us. Phage typing was performed using the sets of typing phages available with us. The strains were discriminated into two different types using the conventional scheme of Basu and Mukherjee. Using the new phage typing scheme phage type 27 was found as the predominant type

Gastrointestinal Tract Pathogens Repository (GTPR):

Division of Microbiology of ICMR-NICED has a well-established GTPR facility which is a national facility) sponsored by the Indian Council of Medical Research (ICMR), New Delhi for the maintenance, and supply of enteric pathogens. As per the directive, I am working in Gastrointestinal Tract Pathogens Repository (GTPR) of ICMR-NICED with the responsibility to look after the laboratory activities of GTPR.

Results of the diagnostic test received from the different divisions of our institutehave communicated to the concerned sender of the strains by this facility.As a national facility GTPR laboratory store strains received for characterization. In this connection, relevant consent for storage of strain in GTPR laboratory has been received from different laboratories who have sent strain for diagnostic or characterization purposes at ICMR-NICED. Strains are being stored following the standard protocols and records are being updating and storage of new strains is ongoing.

Involvement in covid-19 pandemic and sars-cov-2 research work:

Unbelievable rapid spread of SARS-CoV-2 stopped the world from normal functioning since December 2019. ICMR-NICED is deeply involved in research and management of COVID-19 pandemic.

Diagnostic Kit Validation for COVID-19

Performing millions of tests for detection of SARS-CoV-2 was a prime objective of the country during the ongoing COVID-19 pandemic situation. Due to worldwide prevalence of the disease shortage of kits was a big issue and requirement of indigenous kits for real time RT-PCR analysis was very high. ICMR designated NICED as one of the centers for kit validation and I was asked by the Director-NICED to work for kit validation. ICMR-NICED so far validated many kits which are in regular use for diagnosis of COVID-19

SARS-CoV2 Kit Validation:

ICMR-NICED Virology lab has validated >25 RNA and RT PCR kits. Majority of the kits were "Make in India" kits. In addition, the batch testing of RNA and RT PCR kits received at NICED Central Depot was performed to ensure quality of kits prior to distribution to testing labs.

CRISPER based diagnosis of Covid-I9 using paper microfluidics:

In the current scenario of COVID-19 pandemic providing timely diagnosis is a very urgent need. In this connection efforts are ongoing to develop quick diagnostics for COVID-19. We were awarded with a fund from DBT-BIRAC in collaboration with IIT- Guwahati and IIT-Jammu to develop a CRISPR based diagnostics. This work has just initiated and ongoing.

Establishment of Ten ICMR- biorepositories for COVID-19 in India.

For development and validation of new diagnostics, therapeutics or vaccines, access to different kinds of clinical samples from infected patients is an essential requirement. Currently, there is no existing structured procedure for collecting and storing these valuable clinical samples. In view of this, it is important to create designated biorepositories for collecting, storing and maintaining clinical samples (oropharyngeal/nasopharyngeal swabs, bronchoalveolar lavage, sputum, blood, urine and stool) of COVID-19 patients. Such samples will be used in validating newly developed diagnostics, therapeutics, vaccines etc. The main objective of the present work is to create a COVID-19 resource that can be used by scientists, researchers and industry in the current scenario of in future

We have collaborated with three hospitals to proceed with the collection of samples from confirmed COVID-19 positive patients as per the standard protocol since December 2020. So far, we have preserved a total number of 1022 Swab, 316 Plasma, 313 Serum, 77 Stool, 116 Urine and 45 Sputum sample aliquots from a total of 251 participants from the above mentioned three hospitals of which 248 were Cross-Sectional sample and 3 were Follow-up sample. Samples were aliquoted as per the standard methodology and preserved at ICMR-NICED COVID-19 biorepository.

COVAXIN roll out phase: Nodal person for AEFI monitoring for Covaxin in West Bengal

Covaxin has been rolled out under emergency use approval in West Bengal from Feb 3, 2021 and to assess the safety profile of the vaccine, ICMR instructed ICMR-NICED for AEFI monitoring in West Bengal. An AEFI monitoring team constituted by the Director, NICED. Monitored COVAXIN related AEFI for 3 months. Reports were mailed to the Council within 48 h of collection of information. Information collected more than 24000 vaccines were made available to the Council within March 2021. This monitoring and reporting led to the wider roll out of the vaccines in the state as well

Other Services

- Dengue virus serotyping service to West Bengal State Health, Kolkata Municipal Corporation and NVBDCP as a service component and ARL activities.
- Hepatitis C virus RNA detection, viral load estimation, genotyping and HCV drug resistance screening services provided to the collaborative Medical Colleges and Hospitals as a service component.
- Scientists of ICMR-NICED incharge of Diarrhoea treatment unit (DTU) at the OPD of Dr. B. C. Roy Postgraduate Institute of Pediatric Sciences, Kolkata conducts surveillance of diarrhoeal diseases and treat the patients. In addition, blood samples are collected as part of the surveillance for enteric fever.

FLAGSHIP PROGRAMMES-SWACHH BHARAT CAMPAIGN

Due to the ongoing COVID-19 pandemic situation, all educational institutes were closed during this time period. Hence, no programme could be conducted in the schools. However, the members of the ICMR-NICED Swachh Bharat Committee conducted several community-based programmes during the specified time period, except during the complete lock-down phase during March-July 2021.

Report of ICMR-NICED Programmes in the Communities

ICMR-NICED organized several community-based programmes to promote Swachhta-related awareness and practices among the community members, specifically among the urban slum dwellers. The ICMR-NICED team members discussed about safe water as well as safer foods, especially for the children. They also stressed upon keeping their households and surroundings clean and garbage free and encouraged the community members to undertake voluntary cleanliness drives within their localities. Through interactive question and answer sessions in each of these events, the participants were made aware of prevention and management of many common illnesses including diarrhea, hepatitis, typhoid fever, and various mosquito borne diseases. The programmes also incorporated Swachhta issues around ongoing COVID-19 infection.The community-based events that were undertaken are mentioned below:

DATE	COMMUNITY	PARTICIPANTS
August 28, 2020	Slum area in Upendra Chandra Banerjee Road, Kankurgachi, Kolkata-700 054	Around 20 slum dwellers (including 7 children) of both genders.
September 18, 2020	Narkeldanga Slum Area, opposite to Dr. B. C. Roy Post-Graduate Institute of Pediatric Sciences, Kolkata	23 adult participants 14 male and 9 female
September 24, 2020	Slum Area of 20-Gram Kadapara, near EM Byepass, Kolkata-700 054	18 participants of both genders, including 4 children
November 13, 2020	Slum area in Suren Sarkar Road in Ward 33, Beliaghata, Kolkata	22 participants (including 4 childen) of both genders
December 29, 2020	Slum area at 95/H/2, Beliaghata Main Road, Kolkata	17 slum dwellers, including 3 children
January 20, 2021	Slum area of Ward 33, Kolkata Municipal Corporation	Around 25 slum dwellers of both genders, including 6 children
February 26, 2021	Slum area at 94-Pally, Narkeldanga Main Road, Kolkata-700 054	14 participants (8 male and 6 female)
March 26, 2021	Slum area of Ghor Bibi Lane, KMC Ward No. 31, Kolkata	10 participants (4 male and 6 female)

Special drive on cleanliness in and around the campus

A voluntary cleaning activity by the scientists and staff of ICMR-NICED was organized within the premises of ICMR-NICED on October 02, 2020.

Observation of statutory DAYS

On the occasion of 151st birth anniversary of Mahatma Gandhi, ICMR-NICED organized one popular lecture delivered by Dr. Tapas Ghosh, Senior Medical Officer, ID & BG Hospital, Kolkata on October 02, 2020. Following an introductory lecture by Dr. Shanta Dutta, Director, ICMR-NICED, Dr. Ghosh deliberated on the relevance of Mahatma Gandhi and his concept of "Swachhta" in the context of present situation of COVID-19.

Posters and pamphlets on Swachhta Activities in terms of preventing COVID-19 were posted at several locations throughout the institute premises.

OUTBREAK INVESTIGATIONS

Under the leadership of Dr. Shanta Dutta, this institute was involved in various emergency activities in connection with the Covid 19 pandemic situation. Since the inception, ICMR-NICED was designated as the regional center for testing clinical samples by RTPCR for COVID 19 diagnosis in West Bengal and other Eastern states of India. NICED-VRDL (Viral Research Diagnostic Lab) became operational for 24x7 hrs since 1st week of February 2020 and has completed testing of >387870 samples by 8 Jul 2022 by RT PCR and uploaded the data on ICMR portal in timely manner. During earlier days, it also provided diagnostic support to north-eastern states, Jharkhand, Odisha, Sikkim and was involved in capacity building for RTPCR test for SARS-CoV2, to the lab personnel of both Govt. (Medical colleges and hospitals) and non-Govt. Labs in West Bengal. It also acted as quality checking (quality control and quality assurance) center for all the testing labs in West Bengal and provided periodic feedback to ICMR. To further increase the capacity of testing per day, one high throughput machine (COBAS 8800) was launched at NICED by the Honorable PM, GOI on 27 Jul 2020. It acted as one of the ICMR's validation labs for validating COVID-19 RT-PCR kits and RNA Isolation kits before those kits were commercially available.It has been shouldering the responsibility of both Central Depot and the Regional depot for receiving, storage and distribution of diagnostic kits, viral RNA isolation kits and Viral transport media to the labs in eastern and north-eastern regions. The states covered under NICED Central/Regional Depot were West Bengal, Bihar, Odisha, Jharkhand, all North-Eastern States, including Assam, Arunachal Pradesh, Mizoram, Manipur, Nagaland, Tripura and Sikkim. On the directives of EMR Division, Ministry of Health, Govt. of India, Dr. Dutta has provided all support to the central team visiting this state and entrusted one NICED Scientist to become the member of Central Rapid Response Team for supervising the Implementation of Cluster Containment Plan, micro-plan and hospital preparedness for COVID-19 during 18April to 1May, 2020.Epidemiology division of NICED conducted three rounds of repeat cross sectional National COVID-19 sero-survey in selected six districts of West Bengal. The blood samples, collected during the sero-survey, were tested for determining COVID-19 IgG antibody titer and the trend of exposure in the population. ICMR-NICED was involved in Whole Genome Sequencing (WGS) of the SARS CoV-2 virus,present in the clinical samples,was jointly performed with NIBMG, Kalyani and IISC, Bangalore, the data has been published and uploaded in the public domain. NICED was involved in a number of multi centric vaccine trials to determine safety,efficacy and immunogenicitythe vaccines against SARS-CoV 2 infection like Recombinant BCG (rBCG) vaccine trial and phase III trial of the indigenous vaccine (COVAXIN). ICMR-NICED has been selected as one of the ten centres for national COVID-19 biorepositories for collection, storage and maintenance of clinical samples from COVID-19 cases for steering research in developing new diagnostics, therapeutics, vaccines against COVID-19 infection.*Online systems were developed for regular communication, reporting and data generation. To support National policy and generate national level evidence, various collaborative research activities were undertaken by NICED scientists.*NICED also supported basic research on Covid 19, by becoming collaborating partner with IITs and other research organizations.

COVID-19 Pandemic was the greatest challenge of the century because of its high infectivity and little knowledge. ICMR-NICED has been involved in COVID 19 related activities since the beginning of the nationwide lockdown period. With limited human resources, mobility restrictions, the staff of this institute took a humongous task in receiving, testing enormous number of clinical specimens on daily basis round the clock and providing feedback to all concerned agencies.

TRAINING & EXTENSION

A. Important Meetings held at ICMR-NICED

The Scientific Advisory Committee (SAC) of ICMR-NICED 2020 was held on 24-25 September, 2020 virtually in presence of eminent scientists and researchers as SAC members. Director General, ICMR and Chief, ECD addressed ICMR-NICED scientists with their visionary thoughts. The meeting was ended successfully.

Institutional Ethics Committee meeting of ICMR-NICED held on 14th January, 2020

Institutional Ethics Committee meeting

B. Visit of Scientists / Scientific Staff /Academicians

- Dr. Subrata Biswas, Project Coordinator, NACO-Regional Institute (E) for HIV Surveillance delivered a lecture on "HIV Sentinel Surveillance results and fast track targets for bending the HIV curve in India" on 1st December, 2020 at the Seminar Room of NICED-II building.
- Dr. ParthaPratimMajumdar, an internationally acclaimed scientist delivered the ICMR-NICED Foundation Day Oration 2021 on "Geographical sprint of an altered SARS-Cov-2 coronavirus, but with some limps" on 18th February, 2020 at the Seminar Room of NICED-II building.
- Prof (Dr) Koustubh Panda, an eminent scientist and HOD of Department of Biotechnology & B.C. Guha Centre for Genetic Engineering & Biotechnology, University of Calcutta, presented a talk on "The Challenges of Science, Technology & Innovation (STI): Learning Lessons from the Pandemic" on 26th February 2021, National Science Day.
- On 8th March, 2021 Dr. Kanta Dutta, Consultant Pediatrician, Central Health Service, Dept. of Health and Family Welfare, GOI, Prof. Nandini Mukherjee, Dept. of Computer Science & Engineering, Jadavpur University, Kolkata, Prof. Sarmistha Ray Chaudhury, Head of the Dept. of Biophysics Molecular Biology and Bioinformatics, University of Calcutta and Smt. Nibedita Pal, Advocate, Calcutta High Court, shared their perspectives on role of women in their respective professions focusing on the International Women's Day topic "Women in leadership: Achieving an equal future in a COVID-19 world".

C. Significant Achievements:

- ICMR-NICED received recognition of WHO Collaborating Centre for Research and Training on Diarrheal Diseases (WHOCC No. IND-152)
- The Hon'ble Prime Minister Sh. Narendra Modi inaugurated (through video conferencing) three new high-throughput labs with installed automated testing machine (COBAS) under the Indian Council of Medical Research (ICMR) at ICMR-NICPR, Noida, ICMR-NICED, Kolkata and ICMR-NIRRH, Mumbai on July 27, 2020. These facilities were created to meet the increased demand for testing of COVID-19 cases in the country and help in strengthening early detection, treatment, thus controlling the spread of the COVID-19 pandemic. Hon'ble Chief Minister of UP, Sh. Yogi Adityanath, West Bengal, Ms. Mamata Banerjee and Maharashtra, Sh. Uddhav Thackeray; Hon'ble Union Minister of Health & Family Welfare, Dr. Harsh Vardhan; and Prof. (Dr) Balram Bhargava, Secretary, Department of Health Research, and Director-General, Indian Council of Medical Research, attended the event. The labs are enabled to test more diseases other than COVID and post the pandemic, will be able to tests sample of Hepatitis B and C, HIV, Mycobacterium tuberculosis (MTB), Cytomegalovirus (CMV), Chlamydia, Neisseria, Dengue, etc.

Newly created BSL 2+ facility at ICMR-NICED and installation of COBAS 8800; facilities were inaugurated on July 27, 2020 through Video Conferencing Mode by Hon'ble Prime Minister Shri Narendra Modi. Hon'ble Chief Ministers of UP, Sh. Yogi Adityanath, West Bengal, Ms. Mamata Banerjee and Maharashtra, Sh. Uddhav Thackeray; Hon'ble Union Minister of Health & Family Welfare, Dr. Harsh Vardhan and Prof. (Dr) Balram Bhargava, Secretary, Department of Health Research, and Director-General, Indian Council of Medical Research joined the function through video conferencing mode.

- Dr. Harsh Vardhan, Hon'ble Union Minister of Health & Family Welfare; Science & Technology and Earth Sciences visited ICMR-NICED on 6th February, 2021. He has visited Regional VRDL Lab, High throughput automated COBAS 8800 facility at NICED. He encouraged NICED scientists to come up with innovative ideas impacting disease control, promoting health in relevant domains.


Visit of Dr. Harsh Vardhan, Hon'ble Union Minister of Health & Family Welfare; Science & Technology and Earth Sciences to ICMR-NICED on February 6, 2021

- Inauguration of launching of the Phase III regulatory Trial of COVAXIN at ICMR-NICED by His Excellency Sri Jagdeep Dhankhar, Honorable Governor of West Bengal, in presence of first lady, Smt. Sudesh Dhankhar; Swami Shastrajnananda, Principal, Ramkrishna Mission Residential College, Narendrapur and Dr. Shanta Dutta, Director, ICMR-NICED on December 2, 2020. The COVAXIN has been developed indigenously in collaboration with ICMR, ICMR-National Institute of Virology, Pune and Bharat Biotech. ICMR-NICED acted as one of the 24 sites for conducting ICMR sponsored CDSCO approved phase III regulatory trial.

Opening of COVAXIN Trail site by His Excellency Sri Jagdeep Dhankhar, Honorable Governor of West Bengal, in presence of first lady, Smt. Sudesh Dhankhar; Swami Shastrajnananda, Principal, Ramkrishna Mission Residential College, Narendrapur and Dr. Shanta Dutta, Director, ICMR-NICED on December 2, 2020.

- Memorandum of Understanding (MOU) signing between Institute of Bioresources and Sustainable Development (IBSD), Imphal, Manipur and ICMR-National Institute of Cholera & Enteric Diseases (ICMR-NICED), Kolkata in presence of Directors and scientists of both the Institutes.



- NABL Accreditation:

ICMR-NICED provide quality medical laboratory service to comply with ISO 15189:2012 standards all time. The scope has been expanded with different analytes from bacteriology, parasitology, virology and VRDL division in the discipline of Microbiology and Infectious Disease Serology and Molecular Testing of NABL. This year all the divisions have completed desktop surveillance conducted by NABL in accordance with ISO 15189:2012.


National Accreditation Board for Testing and Calibration Laboratories

CERTIFICATE OF ACCREDITATION

ICMR-NATIONAL INSTITUTE OF CHOLERA AND ENTERIC DISEASES

has been assessed and accredited in accordance with the standard

ISO 15189:2012

"Medical laboratories - Requirements for quality and competence"

for its facilities at

in the field of

Medical Testing

Signed for and on behalf of NABL

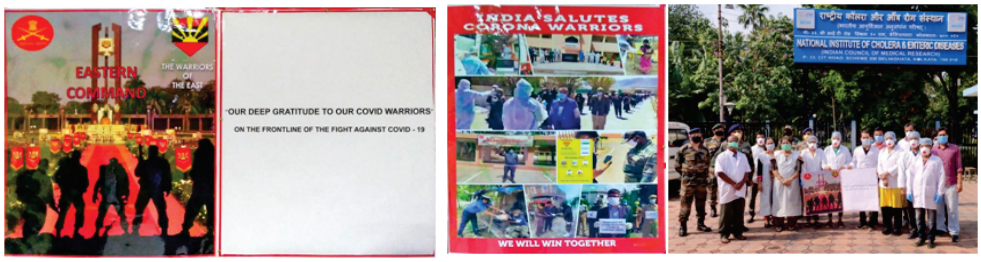
N. Venkateswaran
Chief Executive Officer

D. Training/ Workshop/ Conferences held at ICMR-NICED

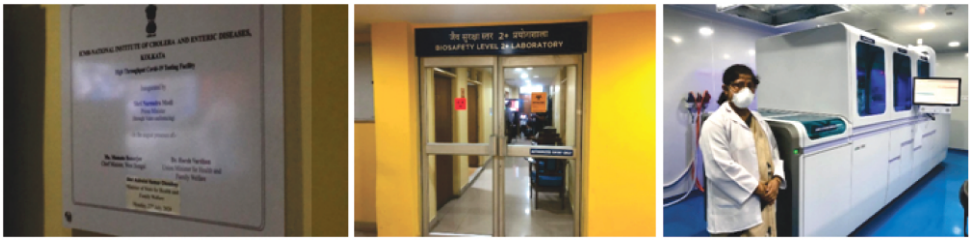
The 2nd Training Workshop on Biosafety and Biosecurity was organized by Regional VRDL, ICMR-NICED, on 18th December, 2020 at Conference Hall, NICED-II. Dr. Shanta Dutta, Director and Scientist G of ICMR-NICED, welcomed the participants and distinguished faculty and emphasized the importance of Biosafety and Biosecurity especially during COVID-19 pandemic situation. The program included lecture sessions on various aspects of Biosafety and Biosecurity and Fire Safety followed by hands-on demonstration of Hand washing, PPE donning and doffing, spill management, triple layer packaging etc. A total of 52 participants and 7 faculty/resource person participated in the training programme. Certificates were distributed among all participants before conclusion of the programme.

Other Events

Felicitation of COVID 19 warriors at NICED-VRDL by EASTERN COMMAND on 4 May 2020 for their untiring efforts towards fight against spread of this infection.



BSL 2+ Lab and high throughput fully automated COBAS 8800 machine has been digitally inaugurated by Hon'ble Prime Minister at ICMR-NICED to increase the testing capacity in the country and to help in strengthening early detection treatment and controlling the number of the infection. The event was attended by Hon'ble Chief Minister of West Bengal, Hon'ble Union Minister and Minister of State for Health & Family Welfare, Govt. of India. The machine will increase the testing capacity of NICED, reduce turn-around-time, minimize human intervention and risk of exposure to health care workers.



Celebration of 74th Independence Day: Flag hoisting ceremony at ICMR-NICED on the occasion of 74th Independence Day of India in present of Director and staff members of NICED.

हिंदी पखवाड़ा : आई.सी.एम.आर – राष्ट्रीय कॉलरा और आंत्र रोग संस्थान में 1 से 14 सितंबर, 2020 तक हिंदी पखवाड़ा का आयोजन किया गया है। पखवाड़े के दौरान 3 सितंबर को NICED-II के सभागार कक्ष मे निबंध लेखन प्रतियोगिता और वाद–विवाद प्रतियोगिता का आयोजन किया गया। प्रतियोगिता में निर्णायक के तौरपर श्रीमती श्रुति मिश्रा, हिंदी प्राध्यापक, हिंदी शिक्षाण योजना, राजभाषा विभाग और संस्थान के वरिष्ट वैज्ञानिक डॉ. अमित पाल रहें। संस्थान के वैज्ञानिकों और कर्मचारियों ने प्रतियोगिता में बढ़–चढ़ कर हिस्सा लिया और आपनों सकारात्मक भूमिका द्वारा आयोजन को सफल बनाया। कार्यक्रम की अध्यक्षता डॉ. ममता चावला सरकार हिंदी समिति की कार्यकारी अध्यक्ष ने की। कार्यक्रम का संचालन रुपल साव, कनिष्ट हिंदी अनुवादक ने किया। अंतत: आयोजन को सार्थक बनाने में हिंदी समिति के सभी सदस्यों की उपस्थिति सराहनीय रही।

हिंदी पखवाड़ा के अवसर पर को वेबिनार : आई. सी. एम. आर – राष्ट्रीय कॉलरा और आंत्र रोग संस्थान में हिंदी पखवाड़ा के अवसर पर 8 सितंबर, 2020 को वेबनार का आयोजन किया गया। जिसमें मुख्य अतिथि वक्ता के तौरपर प्रो. संजय कुमार जयसवाल, विद्यासागर विश्वविद्यालय, हिंदी विभाग वीडियों कॉल द्वारा कार्यक्रम में उपस्थित थे। मुख्य अतिथि वक्ता ने हिंदी भाषा को राष्ट्रीय एकता जोड़ते हुये इतिहास से लेकर वर्तमान तक के परिपेक्ष्य पर बहुत ही प्रभावी ढंग से अपना व्याख्यान प्रस्तुत किया।

हमारे संस्थान में 1 से 14 सितंबर, 2020 तक चलने वाले कार्यक्रम का समापन 14 सितंबर, हिंदी दिवस के दिन किया गया है। इस अवसर पर संस्थान की निर्देशक महोदया डॉ. शांता दत्ता भी उपस्थित थी। 3 सितंबर, 2020 को कार्यालय में आयोजित निबंध लेखन प्रतियोगिता और वाद–विवाद प्रतियोगिता के विजयी प्रतिभागियों और अन्य प्रतिभागियों को निदेशक द्वारा पुरस्कार स्वरूप प्रमाणपत्र और पुरस्कार राशि प्रदान की गई। निदेशक महोदया सभी प्रतिभागियों का मनोबल बढ़ाया और भाषा की महत्ता पर अपने विचार प्रकट किया। साथ ही हिंदी समिति की कार्यकारी अध्यक्ष डॉ. ममता चावला सरकार ने कार्यालय के दैनिक कार्य में हिंदी के प्रयोग को बढ़ावा देने पर बल दिया। कार्यक्रम का संचालन रूपल साव, हिंदी आनुवादक ने किया।

Swachh Bharat Programme: On the occasion of 151th birth anniversary of Mahatma Gandhi, ICMR-NICED organized a programme on 2nd October, 2020. The program was started with the cleaning activities performed within the premises of ICMR-NICED by the scientists led by Director, ICMR-NICED. After that, one popular lecture was delivered by Dr. Tapas Ghosh, Senior Medical Officer, I.D. & B.G. Hospital, Kolkata. In the introductory address, Dr Shanta Dutta stressed on the values of Mahatma Gandhi to be followed in the present world and also on the importance of Swachh Bharat Programme. Dr. Tapas Ghosh in his lecture spoke on the relevance of Mahatma Gandhi in the present situation of COVID-19 and his contribution in raising health awareness across India. He also elaborated the need of cleanliness and Swachh Bharat Abhiyan in this Covid 19 situation. The program ended with delivery of Vote of thanks by Member, Swachh Bharat Committee, ICMR–NICED.



Observation of Jan Andolan Programme: A Pledge taking Program on Jan Andolan for COVID-19 Campaign was organized at ICMR-NICED on 8th October, 2020 through digital platform to maintain physical distancing and safety measures.


Vigilance Awareness Week - 2020 : The Vigilance Awareness Week started on 27th October, 2020 at ICMR-NICED with the pledge taking ceremony through digital platform at ICMR-NICED. The Director, The Vigilance Officer,all the Scientists and staff of ICMR-NICED read the pledge in English, Bengali and Hindi respectively. The week ended on 2nd November, 2020.


Observation of the Constitution Day : All scientists and staff assembled and read the Preamble at ICMR-NICED on 26th November, 2020 coordinated by ICMR Hqrs. New Delhi

Observation of World AIDS Day: ICMR-NICED observed World AIDS Day on 1st December, 2020 at the Seminar Room of NICED-II building. Dr. Subrata Biswas, Project Coordinator, NACO-Regional Institute (E) for HIV Surveillance, ICMR-NICED, delivered a lecture on "HIV Sentinel Surveillance results and fast track targets for bending the HIV curve in India". The program was attended by Scientists, Staff and Students of ICMR-NICED.

Celebration of 72nd Republic Day: 72nd Republic Day of India was celebrated at ICMR-NICED, Kolkata. Director, Staff and their family members participated in the flag hoisting ceremony at 11.00 a.m. on 26th January, 2021 at the premises of NICED-1 building. National Anthem was sung by the staff at the end of the program.

The 59th Foundation Day of ICMR-NICED was celebrated on 18.02.2021. Dr. Shanta Dutta, Director, ICMR-NICED, in her welcome address mentioned the glorious journey and evolution of this institute over the years. Dr. Balaram Bhargava, Secretary, DHR and DG, ICMR delivered the inaugural speech as guest of honour and encouraged the scientists to venture more into translational and public health related research. Dr. Partha Pratim Majumdar, an internationally acclaimed scientist delivered the ICMR-NICED Foundation Day Oration 2021 on "Geographical sprint of an altered SARS-Cov-2 coronavirus, but with some limps". ICMR-NICED`s activity and achievement Report 2019-20 has been released. All scientist, regular and project staff, pensioners and students participated in the ceremony to make the event successful.

National Science Day 2021 was observed at ICMR-NICED on 26th February 2021. Following the welcome address by Dr. Shanta Duitta, Director, ICMR-NICED, Prof (Dr) Koustubh Panda, an eminent scientist and HOD of Department of Biotechnology & B.C. Guha Centre for Genetic Engineering & Biotechnology, University of Calcutta, presented a talk on "The Challenges of Science, Technology & Innovation (STI): Learning Lessons from the Pandemic". After the lecture there was an interactive discussion on the topic with the audience. All Scientists, administrative, technical, project staff and students participated and made the event successful.



ICMR-NICED observed the International Women's Day on 8th March, 2021. Dr. Shanta Dutta, Director, ICMR-NICED inaugurated the program. Four eminent women professionals - Dr. Kanta Dutta, Consultant Pediatrician, Central Health Service, Dept. of Health and Family Welfare, GOI, Prof. Nandini Mukherjee, Dept. of Computer Science & Engineering, Jadavpur University, Kolkata, Prof. Sarmistha Ray Chaudhury, Head of the Dept. of Biophysics Molecular Biology and Bioinformatics, University of Calcutta and Smt. Nibedita Pal, Advocate, Calcutta High Court, shared their perspectives on role of women in their respective professions. A lecture competition on "Women in leadership: Achieving an equal future in a COVID-19 world" was organized for staff of the institute followed by prize distribution. Participation of Scientists, administrative, technical, project staff and students in the programme made the event successful.


गृहमंत्रालय, राजभाषाविभाग, भारत सरकार के निदेशानुसार कोलकाता अवस्थित अनुवाद शिक्षणकेंद्र, केंद्रीय अनुवादब्यूरो, भारत सरकार के तत्ववधान में 12 मार्च, 2021 को आई.सी.एम.आर – राष्ट्रीय कॉलरा और आंत्ररोग संस्थान, कोलकाता के कार्यालय में एकत्वरित अनुवाद प्रशिक्षक कार्यक्रम सम्पन्न हुआ। कार्यक्रम का उदघाटन संस्थान की निदेशक डॉ. शांता दत्ता ने किया। यह प्रशिक्षण कार्यक्रम श्री नवीन कुमार प्रजापति, वरिष्ट सलाहकार एवं केंद्र प्रभारी, केंद्रीय अनुवाद ब्यूरो द्वारा लिया गया। इस प्रशिक्षण में संस्थान के 35 वैज्ञानिकों, अधिकारियों और कर्मचारियों ने भाग लिया। कार्यक्रम सफल रूप से आयोजित हुआ।


EXTRAMURAL PROJECTS

Project Title	:	NICED-Regional Virus Research Diagnostic Lab
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Mamta Chawla Sarkar Scientist F, Dr. Provash Sadhukhan, Scientist E, ICMR-NICED
Funding Agency	:	Department of Health Research
Period	:	2016 - Continuing

Project Title	:	Evaluation of a Typhoid Conjugate Vaccine Introduction Program - Navi Mumbai Municipal Corporation, India
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	World Health Organisation, India
Period	:	2018-2020

Project Title	:	Rational use of drugs
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019-2022

Project Title	:	Centre for Advanced Research on Product Development Centre at NICED Kolkata
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019-2024

Project Title	:	A Multicenter, Phase III, Double-Blind, Randomized, Placebo-Controlled Study to Evaluate the Efficacy of Recombinant BCG VPM 1002 In Reducing Infection Incidence and Disease Severity of SARS-COV-2/COVID-19 Among High-Risk Subjects
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	Serum Institute of India
Period	:	2020-2021

Project Title	:	Estimation of V. cholerae O1 infection in India: a step towards identification of cholera hotspots
Name of PI	:	Dr Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2020 (4 months)

Project Title	:	National Repository of Anti-Microbial Resistant Bacterial Isolates (NRAMRB) at ICMR-NICED: A Pilot study
Name of PI	:	Dr Shanta Dutta, Director and Scientist G, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Sulagna Basu Scientist F, Dr. Asish K Mukhopadhyay Scientist F, Dr. Ranjan K Nandy Scientist F, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019--2021

Project Title	:	Impact of improved diagnostic tools practices training and communication on acute fever case management and antibiotic prescriptions for children, and adolescents presenting at outpatient facilities in the community clinics of ICMR-NICED, India
Name of PI	:	Dr Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	March 2021 (18 months)

Project Title	:	National Surveillance System for Enteric Fever in India
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Suman Kanungo, Scientist E
Funding Agency	:	Christian Medical College, Vellore
Period	:	2018-2020

Project Title	:	Establishment of ten ICMR-Biorepositories for COVID-19
Name of PI	:	Dr. Shanta Dutta
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. AlokChakrabarti, Scientist E
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2020-2021 (6 months)

Project Title	:	Mobile Application for Immunization data in India
Name of PI	:	Dr. Shanta Dutta, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Surajit Basak, Scientist C& Dr. Abhik Sinha, Scientist C ICMR-NICED
Funding Agency	:	DBT-BIRAC
Period	:	2019-2021

Project Title	:	Immunogenicity and Safety of Rotavac® and Rotasiil® Administered in an Interchangeable Dosing Schedule among Healthy Indian Infants: A Multicentric, Phase IV, Open-Labeled, Randomized, Controlled Trial
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Names of CoI / CoPI / Site PI collaborators with name of collaborating institute(s)	:	Dr. Suman Kanungo, Scientist E, ICMR-NICED
Funding Agency:	:	Ministry of Health and Family Welfare, Govt. of Indiathrough Indian Council of Medical Research, New Delhi
Period	:	2018-2020, 2 years

Project Title	:	SaniPath Typhoid- Assessment of Typhoid Exposure Pathways in Low-Income Urban Settings
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Names of CoI / CoPI / Site PI collaborators with name of collaborating institute(s)	:	Dr. Suman Kanungo, Scientist E, Dr. Asish K. Mukhopadhyay, Scientist F, ICMR-NICED

Funding Agency	:	Funding Agency Emory University, Atlanta
Period	:	2018-2021
Project Title	:	Evaluation of Prescription Patterns of Drugs for Diarrheal Diseases and Acute Respiratory Infection in Medicine and Pediatrics OPDs of Tertiary Care Hospitals in West Bengal, India
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G
Names of CoI / CoPI / Site PI collaborators with name of collaborating institute(s)	:	Dr. Suman Kanungo, Scientist E,Dr. Debjit Chakrabarty, Scientist D, Dr. Maloy Kumar Saha, Scientist F, Dr. Hemanta Koley, Scientist E, Dr. Sushmita Bhattacharya, Scientist B, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019 -2020 (1 year)
Project Title	:	Strengthening laboratory surveillance for pneumococcal meningitis in India to understand the impact of pneumococcal conjugate vaccine (PCV) rollout
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Names of CoI / CoPI / Site PI collaborators with name of collaborating institute(s)	:	Dr. Alok Kumar Deb, Scientist F, Dr. Suman Kanungo, Scientist E, Dr. Ashis Kumar Mukhopadhya, Scientist F, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019- 2022
Project Title	:	Human pulmonary Paragonimiasis in crab eating communities and smear negative suspected TB cases from some states of India.
Name of PI	:	Dr. Shanta Dutta, Scientist G & Director, ICMR-NICED
Names of CoI /CoPI Collaborators with name of collaborating institute(s)	:	Dr. Sandipan Ganguly, Scientist F, ICMR-NICED Indian Council of Medical Research, New Delhi
Funding Agency		Indian Council of Medical Research, New Delhi
Period	:	2018 to 2021
Project Title (as PI)	:	External Quality Assurance for HIV testing
Name of PI	:	Dr. Malay Kumar. Saha, Scientist F, ICMR-NICED
Funding Agency	:	National AIDS Control Organization
Period	:	2002 - 2025
Project Title (as PI)	:	HIV Sentinel Surveillance
Name of PI	:	Dr. Malay Kumar. Saha, Scientist F, ICMR-NICED
Funding Agency	:	National AIDS Control Organization
Period	:	2008-2023
Project Title (as PI)	:	Evaluation of diagnostic kits for HIV, HBV and HCV
Name of PI	:	Dr. Malay Kumar. Saha, Scientist F, ICMR-NICED
Funding Agency	:	National AIDS Control Organization
Period	:	2015 – 2025
Project Title (as PI)	:	Molecular detection of HIV in infants and children under age of 18 months.
Name of PI	:	Dr. Malay Kumar. Saha, Scientist F, ICMR-NICED

Funding Agency	:	National AIDS Control Organization
Period	:	2012 – 2025
Project Title (as PI)	:	Counseling and Testing for HIV, Blood Borne Infections and STIs.
Name of PI	:	Dr. Malay Kumar. Saha, Scientist F, ICMR-NICED
Funding Agency	:	WBSAP&CS
Period	:	2012 - 2025
Project Title (as PI)	:	Molecular assay for HIV-1 Plasma Viral Load.
Name of PI	:	Dr. Malay Kumar. Saha, Scientist F, ICMR-NICED
Funding Agency	:	National AIDS Control Organization
Period	:	2015 - 2025
Project Title (as PI)	:	Molecular diversity of Hepatitis C virus in a tertiary care hospital of Manipur, India.
Name of PI	:	Dr. Malay Kumar. Saha, Scientist F, ICMR-NICED
Funding Agency	:	DBT, Govt. of India
Period	:	2018-21
Project Title	:	Regulation of the colonization factor cs6 of enterotoxigenic *Escherichia Coli* in pathogenesis
Name of PI	:	Dr. Dr. Nabendu Sekhar Chatterjee, Scientist F, ICMR-NICED
Names /CoPI	:	Dr. Asish Kumar Mukhopadhyay, Scientist F, ICMR-NICED
Funding Agency	:	Department of Biotechnology (DBT), GOI
Period	:	2018-2021
Project Title	:	Development of new therapeutic against *Vibrio cholerae* O1 which reduces pathogenesis
Name of PI	:	Dr. Nabendu Sekhar Chatterjee, Scientist F, ICMR-NICED
Funding Agency	:	Okayama University, Japan
Period	:	2020-2025
Project Title	:	"A novel therapeutic approach to kill colon cancer cells by microbial protease mediated degradation of microtubule"
Name of PI	:	Dr. Amit Pal, Scientist F, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Sushmita Bhattacharya, Scientist B, ICMR-NICED, Kolkata
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	From 01.02.2021 to 31.01.2024
Project Title	:	"Targeting pro-apoptotic peptide for PAR1mediated programmed cell death in colon cancer cell"
Name of PI	:	Dr. Tanusree Ray
Name of Mentor	:	Dr Amit Pal, Scientist F, ICMR-NICED
Funding Agency	:	DBT

Period	:	From 13.06.2017 to 12.06.2021
Project Title	:	A Novel Diagnostic Tool to Aid Vaccine Evaluation & Surveillance of Enterotoxigenic E. coli & Shigella.
Name of PI	:	Dr. Shanta Dutta, Director & Scientist G, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Asish K Mukhopadhyay, Scientist F, ICMR-NICED
Funding Agency	:	Johns Hopkins University
Period	:	2018-2021
Project Title	:	Retrospective analysis on the evolutionary aspects of Vibrio cholera
Name of PI	:	Dr. Asish K Mukhopadhyay, Scientist F, ICMR-NICED
Names collaborators with name of collaborating institute(s)	:	Dr. Makato Onishi and Dr. Masatomo Morita; NIID, Japan
Funding Agency	:	NIID, Japan
Period	:	2016-2021
Project Title	:	Molecular insights of Vibrio cholerae strains isolated from different parts of India to elucidate its genetic attributes influencing the pathogenesis and rapid transmission leading to epidemics
Name of PI	:	Dr. Asish K Mukhopadhyay, Scientist F, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr Shanta Dutta, Director & Scientist G and Dr. Hemanta Koley, Scientist E, ICMR-NICED
Funding Agency	:	AMED, Japan
Period	:	2020-2024
Project Title	:	Role of Helicobacter pylori Tumour Necrosis Factor Alpha inducing protein (Tip Alpha) in causing gastro duodenal diseases including gastric cancer
Name of PI	:	Dr. Rajashree Das (Amity University)
Names of CoI / CoP I / collaborators with name of collaborating institute(s)	:	Dr. Asish K Mukhopadhyay, Scientist F, ICMR-NICED(Co-PI)
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2017-2020
Project Title	:	Exploratory study to standardize PCR tests on paraffin sections to detect Helicobacter pylori and compare with other detection tests
Name of PI	:	Dr. Asish K Mukhopadhyay, Scientist F, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. R. Sukanya (ICMR-NCDIR, Bengaluru)
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2017-2020
Project Title	:	Differential pathogenesis of Giardia: Genomic variations of local isolates
Name of PI	:	Dr. Sandipan Ganguly, Scientist F, ICMR-NICED

Names of CoI /CoPI Collaborators with name of collaborating institute(s)	:	Dr. Yumiko Nakano Saito, Sr. Research Scientist National Institute of Infectious Diseases, Japan
Funding Agency	:	National Institute of Infectious Diseases, Japan
Period	:	2020 to 2021
Project Title	:	Identification and Molecular Characterization of Common Enteric Parasites in Kolkata with Special Reference to Entamoeba spp.
Name of PI	:	Dr. Sandipan Ganguly, Scientist F, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2017 to 2022
Project Title	:	Characterization of the Pathogenic Factors of Local Isolates of Giardia lamblia
Name of PI	:	Dr. Sandipan Ganguly, Scientist F, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2017 to 2022
Project Title	:	Isolation and molecular characterization of Tenascin in Giardia and its role in pathogenicity
Name of PI	:	Dr. Sandipan Ganguly, Scientist F, ICMR-NICED
Funding Agency	:	CSIR, New Delhi
Period	:	2017 to 2022
Project Title	:	Study of regulation of RNA interference during rotavirus infection and characterization of cellular miRNAs as novel antiviral therapeutics.
Name of PI	:	Mamta Chawla-Sarkar, Scientist F, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Anupam Mukherjee, Sc D, ICMR-NARI
Funding Agency	:	DST-SERB
Period	:	2018-2021
Project Title	:	Coupling virus-host interaction to host subcellular quantitative proteomics: An unbiased integrated approach to decipher host determinants for rotaviral infection
Name of PI	:	Dr. Mamta Chawla-Sarkar, Scientist F, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Nabendu S Chatterjee, Scientist F, ICMR-NICED
Funding Agency	:	WB-DST
Period	:	2018-2021
Project Title	:	Cutting the host-aids: Studying mechanistic to host cellular determinants that are usurped by rotaviral viroplasmic proteins to design novel antiviral therapeutics :2020-2023
Name of PI	:	Dr. Mamta Chawla Sarkar, Scientist F, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2020- 2023

Project Title	:	To study the bacterial aetiology, antimicrobial sensitivity pattern resistance determinants and associated risk factors of neonatal sepsis in 4 different districts of Assam
Name of PI	:	Dr Utpala Devi, RMRC, Dibrugarh Dr Reeta Rasailly, ICMR, New Delhi Dr Sulagna Basu, Scientist F, ICMR NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. P.K.Borah, Dr J Mahanta, Dr K. Narain, RMRC, Dibrugarh Dr. Shanta Dutta Director & Scientist G, Dr. Ranjan Nandy, Scientist F ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019-2022

Project Title	:	Bacterial etiology, antimicrobial susceptibility, resistance determinants in gram negative bacteria isolated from intensive care units in Agartala: Focusing transmissible carbapenem and colistin resistance (Co Principal Investigator) 2019-2022
Name of PI	:	Dr. Tapan Majumdar (AGMC, Tripura)
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Sulagna Basu, Scientist F, ICMR-NICED Dr. Pradip Bhowmik, Dr. Sanjib Kr. Debbarma, Dr. Debasish Barman, AGMC & GBPH Dr. Harpreet Kaur, ICMR Headquarters, New Delhi
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019-2022

Project Title	:	Strategy to study screening of anti-CMV (Cytomegalovirus) compounds from some medicinal and edible mushrooms
Name of PI	:	Dr. Nilanjan Chakraborty, Scientist F, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Swapan kr. Ghosh, PG Department of Botany, Ramakrisna Mission Vivekananda Centenary College, Rahara (N) 24Parganas
Funding Agency	:	WB-DST
Period	:	2017 to 2020

Project Title	:	"Strengthening/ Promoting evidence-based advocacy for influenza prevention and control in India"
Name of PI	:	Dr. Suman Kanungo, Scientist E, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Alok Kumar Chakrabarti (Lab PI), ICMR-NICED
Funding Agency	:	CDC-AIIMS
Period	:	2017-2022

Project Title	:	An Event-driven, Phase 3, Randomized, Double-blind, Placebo-controlled, Multicenter study to evaluate the efficacy, safety, immunogenicity and Lot-to-Lot consistency of BBV 152, a Whole-virion inactivated SARS-CoV-2 vaccine in adults ≥ 18 years of age
Name of PI	:	Dr. Suman Kanungo, Scientist E, ICMR-NICED
Names of CoI / CoPI /	:	Dr. Shanta Dutta, Scientist G & Director, ICMR-NICED

collaborators with name of collaborating institute(s)		
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	Dec. 2020 (15 months)
Project Title	:	Development of a combination next generation Outer Membrane Vesicles (OMVs) based immunogen to reduce multi drug resistant non-typhoidal Salmonella and Campylobacter mediated clinical health burden.
Name of PI	:	Dr. Hemanta Koley, Scientist E, ICMR-NICED
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Dr. Asis Kumar Mukherjee, Scientist F, ICMR-NICED Dr. Shanta Dutta, Director & Scientist G, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2021 to 2024
Project Title	:	Potential probiotic application of novel commensal *E. coli* with antagonistic activity against different enteric pathogen.
Name of PI	:	Dr. Hemanta Koley, Scientist E, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2021 to 2024
Project Title	:	Development of vaccine against entero-pathogenic Escherichia coli.
Name of PI	:	Dr. Hemanta Koley, Scientist E, ICMR-NICED
Funding Agency	:	Okayama University (OUP-4-4-E)
Period	:	2021 to 2026
Project Title	:	Development of universal shigella vaccine based on virulence gene expression
Name of PI	:	Dr. Hemanta Koley, Scientist E, ICMR-NICED
Funding Agency	:	NIID, Japan
Period	:	2021 to 2024
Project Title	:	Studies on vascular endothelial dysfunction molecules in dengue virus infection: In search of an early potential marker for DHF/DSS.
Name of PI	:	Dr. Provash Chandra Sadhukhan, Scientist E, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Shanta Dutta, Dr. Tapan Biswas, ID & BG Hospital, Kolkata Dr. Sandip Samanta, Dr. B. C. Roy Post Graduate Institute of Paediatric Sciences, Kolkata
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2020-2023
Project Title	:	"Isolation and characterization Diarrhea associated bacteriophages and their use in Phage Therapy"
Name of PI	:	Dr.Alok Kumar Chakrabarti, Scientist D, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr.HemantaKoley, Scientist E, and Dr Shanta Dutta, Scientist G & Director, ICMR-NICED

Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2021-2024

Project Title	:	Studies on HCV drugs resistance in HCV infected patients in Eastern part of India
Name of PI	:	Dr. Provash Chandra Sadhukhan, Scientist E, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019-2021

Project Title	:	A systematic assessment of acute viral hepatitis and chronic liver diseases in Northeast India with special reference to strengthening of laboratories in the region
Name of PI	:	Dr. Provash Chandra Sadhukhan, Scientist E, ICMR-NICED(Site PI)
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Abhik Sinha, Scientist C, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2018-2021

Project Title	:	"CRISPER based diagnosis of Covid-I9 using paper microfluidics"
Name of PI	:	Dr. Alok Kumar Chakrabarti, Scientist D, ICMR-NICED
Funding Agency	:	DBT-BIRAC
Period	:	2020-2021

Project Title	:	Assessment of prophylactic and therapeutic role of BCG against SARS CoV2 infection: study in hamster model.
Name of PI	:	Dr. Moumita Bhaumik, Scientist C, ICMR, Pragya Yadav (ICMR-NIV)
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Mamta Chawla-Sarkar, Scientist F, ICMR-NICED
Funding Agency	:	DBT-BIRAC
Period	:	2021- 2022

Project Title	:	Sphingolipid as mediator in the interface of microbiome and host: implication in gut pathology
Name of PI	:	Dr. Moumita Bhaumik, Scientist C, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Shanta Dutta, Director & Scientist G. ICMR-NICED
Funding Agency	:	DST-SERB
Period	:	2021-2024

Project Title	:	Therapeutic intervention of *Shigella flexneri* host pathogen interaction by a small molecule herbal compound
Name of PI	:	Dr. Sushmita Bhattacharya, Scientist B, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Moumita Datta, Scientist C, ICMR-NICED
Funding Agency	:	ICMR extramural

Period	:	2019-2022
Project Title	:	Role of HMGB1 in *H pylori* mediated gastric cancer: A possible therapeutic candidate
Name of PI	:	Dr. Sushmita Bhattacharya, Scientist B, ICMR-NICED
Names of CoI / CoPI / collaborators with name of collaborating institute(s)	:	Dr. Ashis K. Mukhopadhaya, Scientist F, ICMR-NICEDICMR-NICED Dr Sovan Sarkar, University of Birmingham, UK
Funding Agency	:	DBT BIOCARE
Period	:	2019-2022

PUBLICATIONS

1. Adriaenssens EM, Sullivan MB, Knezevic P, van Zyl LJ, Sarkar BL, Dutilh BE, Alfenas-Zerbini P, Łobocka M, Tong Y, Brister JR, Moreno Switt AI, Klumpp J, Aziz RK, Barylski J, Uchiyama J, Edwards RA, Kropinski AM, Petty NK, Clokie MRJ, Kushkina AI, Morozova VV, Duffy S, Gillis A, Rumnieks J, Kurtböke İ, Chanishvili N, Goodridge L, Wittmann J, Lavigne R, Jang HB, Prangishvili D, Enault F, Turner D, Poranen MM, Oksanen HM, Krupovic M. Taxonomy of prokaryotic viruses: 2018-2019 update from the ICTV Bacterial and Archaeal Viruses Subcommittee. Arch Virol. 2020 May;165(5):1253-1260.
2. Alam J, Sarkar A, Karmakar BC, Ganguly M, Paul S, Mukhopadhyay AK. Novel virulence factor *dupA* of *Helicobacter pylori* as an important risk determinant for disease manifestation: An overview. World J Gastroenterol. 2020 Aug 28;26(32):4739-4752.
3. Banerjee A, Sarkar R, Mitra S, Lo M, Dutta S, Chawla-Sarkar M. The Novel Coronavirus Enigma: Phylogeny and Analyses of Co evolving Mutations Among the SARS-CoV-2 Viruses Circulating in India. JMIR Bioinform Biotech. 2020 Sep 7;1(1):e20735. .
4. Banerjee S, Bhattacharya A, Roychoudhury P, Dasgupta AK,Dutta M, Pal R. *Arthrospira platensis* (Cyanobacteria)– a potential biofactory for fluoromagnetic nano iron production. Phycologia 2021.
5. Banerjee S, Vishakha K, Das S, Dutta M, Mukherjee D, Mondal J, Mondal S, Ganguli A. Antibacterial, anti-biofilm activity and mechanism of action of pancreatin doped zinc oxide nanoparticles against methicillin resistant *Staphylococcus aureus*. Colloids Surf B Biointerfaces. 2020 Jun;190:110921.
6. Basu S. Variants of the New Delhi metallo-β-lactamase: new kids on the block. Future Microbiol. 2020 May;15:465-467.
7. Bhattacharya D, Dutta M, Mukhopadhyay M, Bhattacharyya M, Chowdhury S, Karmakar P. The protective role of metformin in autophagic status in peripheral blood mononuclear cells of type 2 diabetic patients. Cell Biol Int. 2020 Aug;44(8):1628-1639.
8. Bhatta M, Dutta N, Nandi S, Dutta S, Saha MK. Mother-to-child HIV transmission and its correlates in India: systematic review and meta-analysis.BMC Pregnancy Childbirth.2020 Sep;20(1):509.
9. Bhatta M, Nandi S, Dutta N, Dutta S, Saha MK. HIV Care Among Elderly Population: Systematic Review and Meta-Analysis. AIDS Res Hum Retroviruses. 2020 Jun;36(6):475-489.
10. Biswas S, Chakraborty D, Ghosh P, Kumar P, Adhikary R, Saha MK. HIV Risk profile and its socio-demographic correlates among long-distance truckers in West Bengal, India: Evidence from national HIV sentinel surveillance 2017. Indian J Public Health. 2020 Apr;64(Supplement):S8-S14.
11. Biswas S, Ghosh P, Chakraborty D, Kumar A, Aggarwal S, Saha MK. Variation in injecting drug use behavior across different North-eastern States in India. Indian J Public Health. 2020 Apr;64(Supplement):S71-S75.
12. Biswas S, Sinha A, Rajan S, Khan PK, Joshi DS, Saha MK. Human immunodeficiency virus prevalence and high-risk behavior of home-based and nonhome-based female sex workers in three high-prevalent North-Eastern States of India. Indian J Public Health 2020 Apr;64:S46-52
13. Chakraborty A, Chakraborty A, Smith K, Chakraborty D, Guha S. Physical Therapy for Neurodegenerative Diseases: An Educational Approach. Neurology Neurobiol 2020 Sept;3(3):1-4
14. Chakraborty A, Guha S, Chakraborty D. Micronutrients in Preventing Cancer: A Critical Review of Research. Asian Pac J Cancer Biol. 2020 Aug; 5 (3): 119-125.
15. Chakrabarti AK, Biswas A, Tewari DN, Mondal PP, Dutta S. Phage Types of *Vibrio cholera* O1 Biotype EITor Strains Isolated from India during 2012-2017. J Glob Infect Dis. 2020 Apr-Jun; 12(2): 94-100.
16. Chakraborty D, Debnath F, Biswas S, Bhatta M, Ganguly S, Deb AK, Saha MK, Dutta S. Exploring Repurposing Potential of Existing Drugs in the Management of COVID-19 Epidemic: A Critical Review. J Clin Med Res. 2020 Aug;12(8):463-471.
17. Chakraborty D, Guha S, Chakraborty AK. Critical Review on Role of Some Nutritional Components in Prevention of Cancer in India: An Educators Role. J Cancer Res Therap Oncol 2020;8: 1-8.
18. Chatterjee A, Chakraborty N. Association of Human Cytomegalovirus Infection with Different Forms of Diabetes. Interventions Obes Diabetes.2020 Apr;4(1):316–7.
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21. Chawla-Sarkar M, Banerjee A, Lo M, Mitra S, Okamoto K, Deb A, Dutta S. A decade-long temporal analyses of human group-A rotavirus among children with gastroenteritis: Prevaccination scenario in West Bengal, eastern India. J Med Virol. 2020 Aug;92(8):1334-1342.

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24. Das Mahapatra A, Patra C, Mondal J, Sinha C, Sadhukhan PC, Chattopadhyay D. Silver Nanoparticles Derived from *Albizia lebbeck* Bark Extract Demonstrate Killing of Multidrug-Resistant Bacteria by Damaging Cellular Architecture with Antioxidant Activity. Chemistry Select 2020 April; 5: 4770.

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31. Ganguly S, Chakraborty D. Utility of Sms Based Reporting For Supply Chain Management and Fast Tracking PMTCT Intervention- A Pilot Study in West Bengal. Indian J Applied Res. 2020 Apr;10(4):11-12 (DC)

32. Ganguly S, Sardar SK, Bhattacharya SK. Soil-transmitted Helminths Infection in India. EC Endocrinol Metabolic Res. 2020 Sept; 5(10): 24-29

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Book Chapter

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Nodal Officer of RTI Online Portal	Dr. Ranjan Kr. Nandy, Scientist-F
CPIO (Central Public Information Officer)	Dr. Sulagna Basu, Scientist-F
CPIO	Administrative Officer
DPIO	Mr. Avijit Chakraborty, Technical Officer

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Member Secretary	Ms. Saheli Samanta, Sr.TO-2
Member	Dr. Miratun Nahar, President, Talash, NGO
Co-opted member	Dr. Moumita Bhaumick, Scientist C

Library Committee

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Biosafety Officer	Dr. Alok Kr Deb, Scientist F, ICMR-NICED
Member (Internal Expert)	Dr. N S Chatterjee, Scientist F, ICMR-NICED
Member (Internal Expert)	Dr. Sulagna Basu, Scientist F, ICMR-NICED
Member (Internal Expert)	Dr. Hemanta Koley, Scientist E, ICMR-NICED

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Dr. M. K. Saha, Scientist F (compulsorily retired on 28.01.2021)
Dr. N. S. Chatterjee, Scientist-F (transferred to ICMR Hqrs on 12.02.2021)
Dr. R. K. Nandy, ScientistF
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Dr. A. Majumdar, Scientist C (joined on 20.04.2020)
Dr. S. Bhattacharya, Scientist B

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Mr. S. R. Ghosh, Technical Officer A
Mr. A. Ganai, Technical Officer
Ms. M. Mallick, Technical Officer
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Ms. M. Das, Technical Assistant
Mr. M. L. Gupta, Technician-B (retired on 30.06.2020)
Mr. P. Samanta, Laboratory Assistant
Mr. S. Dey, MTS (General)

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Mr. R. L. Saha, Sr. Technical Officer (2), (retired in December 2020)
(Worked in Maintenance division from May 2020)
Mr. S. Shil, Sr. Technical Officer (1)
Mr. C. Mandal, Sr. Technical Officer (1)
Mr. A. Chakraborty, Technical Officer (Posted at Personnel Section)
Mr. S. Basu, Health Assistant

Clinical Medicine Division
Mr. A. Pal, Technical Officer
Mr. K. G. Saha, Laboratory Assistant
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Ms. P. Bhaumik, Technical Officer

Mr. K. Sen, Technical Assistant (Transferred to RMRIMS, Patna on 18.03.2021)
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Md. M. Hossain, Sr. Technician (1)
Mr. P. Turi, Laboratory Assistant (transferred to RMRC Dibrugarh on 18.03.2021)
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Mr. S. Balmiki, Laboratory Assistant

Maintenance, Instruments & Equipment Section
Mr. P. K. Ghoshal, Principal Technical Officer (retired on 31.05.2020)
Mr. A. R. Das, Caretaker (retired on 31.03.2021)
Mr. K. Dey, Sr. Technician-1
Mr. B. Mandi, Laboratory Assistant
Mr. S. Hazra, Laboratory Assistant (transferred to RMRC Dibrugarh on 18.03.2021)
Mr. A. Das, Laboratory Assistant (transferred to RMRIMS, Patna on 26.02.2021)
Mr. B. Moshi, Laboratory Assistant
Mr. B. Hela, Laboratory Assistant
Mr. A. Seal, MTS (General)
Mr. S. Maiti, MTS (General)

Media Section
Mr. K. Ghosal, Laboratory Assistant
Mr. S. Mondal, Laboratory Attendant 2
Mr. V. K. Singh, Laboratory Assistant (transferred to RMRC Dibrugarh on 26.02.2021)

ICMR Virus Laboratory
Mr. R. Hela, Laboratory Assistant

Director's Secretariat
Mr. S. Bernard, Private Secretary
Mr. S. Sen, Personal Assistant
Mr. N. G. Sutradhar, Laboratory Assistant

Office of the Administrative Officer
Mr. P. K. Bose, Administrative Officer (retired on 31.01.2021)
Mr. S. Bernard, Administrative Officer (additional Charge)
Mrs. R. Jaiswal, Upper Divisional Clerk
Mr. Omkar Lal, Laboratory Assistant (transferred to RMRC Dibrugarh on 26.02.2021)
Mr. Kh I Singh, MTS (General)

Accounts Section
Mr. P. Chatterjee, Accounts Officer
Mr. S. Mullick, Assistant
Mr. D. Kumar Gayen, Section Officer
Mr. A. Banerjee, Telephone Operator
Mr. M. S. Das, Lower Division Clerk

Cash Section
Mr. C. Naskar, Assistant
Mr. Arup Chandra, Upper Division Clerk

Dispatch Section
Mr. B. Roy, Laboratory Assistant
Mr. J. Malakar, Laboratory Assistant

Establishment Section
Dr. S. K. Sadhukhan, Sr. Technical Officer 1(retired on 31.03.2021)
Mr. G. C. Das, Assistant (transferred to NIOH, on 31.10.2020)
Mr. R. Chowdhury, Assistant (promoted to Jr. Accounts Officer and transferred to NIRT Chennai on 22.03.2021)
Mr. B. Ganguly, Technician (2) (first half duty)
Mrs. M. Bhattacharya, Lab Attendant 2

Training & Extension
Mr. A. Jana, Technician B (passed away on 14.06.2020)
Mr. S. Adhikary, Laboratory Assistant

Store Section
Mr. V. Besra, Section Officer
Mr. S. Omesh, Technical Officer-A
Mr. A. Mitra, Sr. Technician 3
Mr. B. Mitra, Laboratory Assistant

Pension Section
Mr. A. Kumar, Section Officer (joined after being transferred from RMRIMS, Patna)
Mr. K. Sharma, Upper Division Clerk

Personnel Section
Mr. A. Kumar, Section Officer
Mr. S. Shil, Sr. Technical Officer 1
Mr. A. Chakraborty, Technical Officer
Mr. P. Guha, Upper Division Clerk
Mr. R. Hela, Laboratory Assistant

Vehicle Section
Mr. D. K. Chowdhury, Sr. Technician 3
Mr. H. P. Das, Sr. Technician 3
Mr. A. K. Dutta, Sr. Technician 2
Mr. R. Bhakta, Sr. Technician 3
Mr. S. Das, Sr. Technician 1 (transferred to RMRC Dibrugarh on 26.02.2021)
Mr. D. Dey, Technician 2

Regional VRDL, ICMR-NICED
Dr. A. Majumdar, Scientist C
Dr. S. Mukherjee, Research Scientist II (Non-Medical)
Dr. H. Banu, Research Scientist I (Medical)
Dr. A. Chatterjee, Research Scientist I (Non-Medical) Ms. Madhumonti Biswas, Research Assistant
Mr. Rudrak Gupta, Research Assistant
Mr. Abhishek Basu, Laboratory Technician (joined on 21.11.2019)
Ms. Shreema Chakraborti, Laboratory Technician Mr. Satyabrata Ghorai, Laboratory Technician Mr. Chinmoy Mondal, Laboratory Technician
Mr. Soumodip Mitra, Data Entry Operator Mr. Nayan Basuli, Data Entry Operator
Mr. Biswajit Dey, MTS

Mr. Kartick Chandra Mondal, MTS Mr. Tapan Turi, MTS
Mr. Ranajoy Sarkar, MTS Ms. Sutapa Hazra, MTS
Mr. Asish Kumar Jana, MTS
Mr. Arghyadip Majumder, Laboratory Technician, CRSS

Scientists Associated with ICMR-NICED

Dr. A. Ghosh, J.C. Bose Distinguished Chair, Professor, National Academy of Science, India
Dr. M. K. Chakrabarti, ICMR Emeritus Scientist
Dr. A. N. Ghosh, ICMR Emeritus Scientist
Dr. M. K. Bhattacharya, ICMREmeritus Scientist
Dr. B. L. Sarkar, ICMR Emeritus Scientist
Dr. B. Manna, ICMR Emeritus Scientist

Employees who Joined ICMR-NICED during 2020-21

Name	*Designation*	*Date of Joining*
Dr. Agnibha Majumdar	Scientist C	20.04.2020
Mr. A. Kumar	Section Officer	10.08.2020

Employees who retired from ICMR-NICED during 2020-21

Name	*Designation*	*Date of retirement from service*
Mr. Pradip Kumar Ghoshal	Principal Technical Officer	31.05.2020
Mr. Motilal Gupta	Technician B	30.06.2020
Mr. Ratan Lal Saha	Sr. Technical Officer 2	31.12.2020
Dr. Malay Kumar Saha (compulsorily retired)	Scientist F	28.01.2021
Mr. Pradip Kumar Bose	Administrative Officer	31.01.2021
Mr. Jagadish Kharwar	Technical Officer A	31.01.2021
Dr. Salil Kumar Sadhukhan	Sr. Technical Officer 1	31.03.2021
Mr. Ashit Ranjan Das	Caretaker	31.03.2021

Obituary…our tribute and homage
"You will always be remembered…rest in eternal peace"

Name	**Passed away on**
Lt. Mouji Lal	15.04.2020
Lt. Kamini Kumar Sarkar	23.05.2020
Lt. Anath Jana	14.06.2020
Lt. Arun Sarkar	20.08.2020
Lt. Kajal Kanti Mazumder	11.09.2020
Lt. Dr. Uma Ganguly	17.09.2020
Lt. Archana Chatterjee	09.11.2020
Lt. Sujit Ranjan Chowdhury	11.11.2020



Designed & Printed by
Nandita Printers
19/1/1B, Patwar Bagan Lane (Baithakkhana)
Kolkata - 700 009
nanditaprintersm@gmail.com